

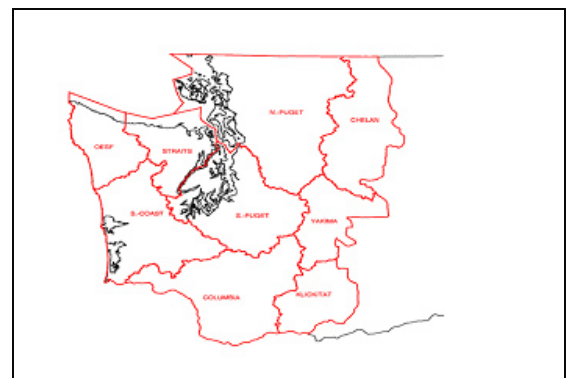


WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES  
**HABITAT CONSERVATION PLAN**  
**5-YEAR COMPREHENSIVE REVIEW**



5-Year Comprehensive Review – Report to Services:  
NOAA Fisheries  
U.S. Fish and Wildlife Service

For the period  
January 1, 1999 – December 31, 2003



**Habitat Conservation Plan**  
5-Year Comprehensive Review  
May 2004



WASHINGTON STATE DEPARTMENT OF  
**Natural Resources**

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**Department of Natural Resources  
Habitat Conservation Plan  
5-Year Comprehensive Review  
Executive Summary  
May 2004**

This HCP Comprehensive Review marks the completion of the first 5 years of implementation of the WA Department of Natural Resources (DNR) Habitat Conservation Plan (HCP). In January 1997, the DNR entered into a long-term management plan, authorized under the Endangered Species Act, with the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (currently re-named as NOAA Fisheries). For DNR, this HCP allows timber harvest and other management activities to take place, while emphasizing wildlife species conservation and ecosystem health as the basis for prudent trust management.

The DNR's HCP covers state forestlands managed by DNR within the range of the northern spotted owl. This includes approximately 1.6 million acres of state trust lands west of the Cascade and a small area east of the Cascade crest. The DNR's HCP provides conservation benefits to a broad range of species within a five-tiered approach:

1. Riparian management zone conservation strategy.
2. Northern spotted owl conservation strategy
3. Marbled murrelet conservation strategy
4. Conservation strategies for 80-120 additional candidate wildlife species, endemics, and other species likely to be listed.
5. Forest health

The implementation of the HCP is governed by an agreement among the USFWS and NOAA Fisheries (Services). The Implementation Agreement defines the roles and responsibilities of these parties regarding implementation of the HCP. Together they fulfill the requirements as outlined in the Endangered Species Act for issuance of an incidental take permit.

DNR also monitors the HCP according to the following objectives for all of the planning units:

1. To determine whether the HCP conservation strategies are implemented as written (implementation monitoring).
2. To determine whether implementation of the conservation strategies results in anticipated habitat conditions (effectiveness monitoring).
3. To evaluate cause-and-effect relationships between habitat conditions resulting from implementation of the conservation strategies and the animal populations these strategies are intended to benefit (validation monitoring).

The conservation strategies in the HCP also require that research be carried out to answer certain specific questions and to fulfill the following objectives:

1. To obtain information needed to move from short- to long-term conservation strategies.
2. To obtain information needed to assess and improve the effectiveness of the conservation strategies.
3. To obtain information needed to increase management options and commodity production opportunities for lands managed pursuant to the HCP.

The objectives of the HCP 5-Year Comprehensive Review are threefold:

1. To measure the progress DNR has made in successfully implementing the commitments and conservation strategies outlined in the HCP.
2. To report on the progress of the various monitoring and research projects that are being conducted throughout each planning unit.
3. To measure trends and habitat conditions on the landscape.

The Services expressed a great deal of satisfaction in the DNR's fulfillment of the HCP commitments up to this date. They expressed their appreciation of the strong working relationship between agency staff members, and noted the successes achieved and challenges faced by DNR in overall HCP implementation.

The Services identified the following success to DNR's HCP implementation:

1. Actual HCP implementation in the field
2. HCP/Scientific Section organizational structure
3. Implementation Monitoring Program
4. NRF and Dispersal habitat determinations per Watershed Administrative Unit
5. Riparian Forest Restoration Strategy
6. Klickitat Planning Unit Amended Northern Spotted Owl Conservation Strategy
7. Staff collaboration in the Long-term Marbled Murrelet Conservation Strategy

The Services also identified the following areas of HCP implementation that may need some improvement:

1. Better documentation and tracking of non-timber resources (i.e., sand, gravel, rock pits, communication sites, rights-of-way, special forest products, etc.)
2. Better geographic tracking of stand structure and development stages and age class distributions on the landscape (as identified in the HCP page IV. 180).
3. Better fulfillment of the HCP commitments and priorities in research
4. Strengthen and broaden effectiveness monitoring to all planning units.
5. Better tracking of public use and recreation activities (i.e., campgrounds, public trail systems, etc.)
6. Written documentation to the Services identifying that Road Maintenance and Abandonment Plans (RMAPs) will be used as DNR's comprehensive landscape-based road network management process.

The DNR will continue to report on the progress of HCP implementation to the USFWS and NOAA Fisheries through DNR's HCP Annual Meetings and Reports. The next HCP Comprehensive Review to the Services is scheduled for 2009. Thereafter, Comprehensive Reviews will be conducted every tenth anniversary for the full term of the HCP agreement.

As the manager of the agency's Habitat Conservation Plan, I am very proud of DNR's strong commitment to the successful implementation of the HCP. I also appreciate and enjoy the working relationship our agency has with staff at USFWS, NOAA Fisheries, and WA Dept. of Fish and Wildlife (WDFW). We continue to maintain a very collaborative and effective work environment that has been very beneficial to the progress of DNR's HCP.

Lastly, I would like to acknowledge the staff of the HCP/Scientific Section of DNR's Land Management Division. Two of their overarching job duties are to ensure that the HCP is applied on the ground effectively and accurately, and to make sure the HCP conservation commitments have been fulfilled. Every day I come to work, I continue to be impressed with each person's dedication to doing his/her best job possible. They are the reason the HCP is such a success to the DNR, which has provided such a benefit to the agency's trust mandate and to wildlife conservation as a whole on DNR managed lands.

Sincerely,  
Tami Riepe  
DNR HCP Implementation Manager



## Introduction

The Washington State Department of Natural Resources (DNR) Habitat Conservation Plan (HCP) is a forest management plan that applies to approximately 1.6 million acres of forestlands within the range of the northern spotted owl (*Strix occidentalis*) and managed by the DNR. The HCP is a partnership between the DNR and the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (now known as NOAA Fisheries) (Services), authorized under the Endangered Species Act (ESA). In general, the HCP includes all DNR trust lands west of the Cascade crest and those on the eastern slopes of the Cascades, from the Canadian border to the Columbia River. The HCP enables DNR to comply with ESA requirements by defining conservation objectives and strategies that provide habitat for listed and unlisted species while providing certainty, flexibility, and stability for the DNR in meeting its trust responsibilities.

The Habitat Conservation Plan includes habitat management strategies for both ESA listed species and unique habitats.

HCP trust land management strategies focus primarily on habitat conservation and enhancement for species listed under the ESA. DNR's habitat management plan identifies specific habitat conservation strategies for the northern spotted owl, marbled murrelet, and for riparian dependent species such as bull trout and salmon. In addition, the HCP provides specific habitat protection appropriate for numerous state and federal-listed species of concern. The objectives and strategies in the HCP are designed to conserve and enhance habitats that are biologically appropriate for the support of multiple species, both listed and unlisted. By providing appropriate habitat protection for species not currently listed or protected under the ESA, the Department hopes to avoid future disruptions to land management planning caused by new ESA listings.

Protection of special or unique habitats includes identification of critical habitats, caves, talus slopes, wetlands, and nesting sites for many species. Future research and monitoring could identify new species and habitat needs, necessitating modified management practices. Therefore, the HCP is also a dynamic, scientifically based management-planning tool.

## Monitoring, Research, and Reporting

Under the terms of the HCP, the DNR is required to monitor its HCP (implementation, effectiveness and validation monitoring) and to annually report the results of its monitoring; to conduct research (especially in relation to the priority research topics outlined in the HCP) and to annually report the results of research; and to provide summaries of activities carried out on DNR-managed lands in an HCP Annual Report.

## Comprehensive Reviews

Periodically, the parties to the agreement will also conduct comprehensive reviews. Comprehensive reviews are required at the end of the 5<sup>th</sup> and 10<sup>th</sup> years, and every 10 years thereafter throughout the term of the HCP. The DNR began full implementation of its HCP in January 1999 and the first of the required comprehensive reviews was due in 2004. Since this was the first comprehensive review of DNR's HCP, department staff



met with representatives from the USFWS and NOAA Fisheries to get input about the topics they would like covered and the general format for presenting the information. The Services gave the Department a list of topics and specific questions they would like us to discuss during the comprehensive review meeting, and we agreed that the information would be provided through a PowerPoint<sup>®</sup> presentation, with supplemental reports and maps. The list of topics covered a broad range of subjects including:

- Changes to our land base due to acquisitions, dispositions and exchanges
- Contributions of Natural Areas (Natural Area Preserves [NAPs] and Natural Resource Conservation Areas [NRCAs]) to the HCP conservation objectives
- Updates on research and monitoring conducted over the past 5 years
- Update on the amounts (acres) of silvicultural activities compared to the 10-year projections in the HCP (p. IV.211)
- Update on landscape planning (now known as implementation planning)
- Update on Road Maintenance and Abandonment Plans (RMAPs) - OESF
- Updates on riparian, grizzly and lynx procedures
- Current status and updates on spotted owl, murrelet and riparian initiatives including:
  - Spotted owl NRF (Nesting, Roosting, and Foraging) and Dispersal habitat definitions and amounts
  - Klickitat amendment proposal
  - Murrelet long-term strategy
  - Small (1<sup>st</sup> order) stream research
- Status of funding and expenditures to implement the HCP
- How DNR and the Services can maintain and strengthen implementation of the HCP

The Department also had specific objectives for this review, namely: to review our current progress on implementation of the HCP; to provide status updates on the conservation strategies; and to discuss successes that have been achieved, challenges that have been faced and areas that may need improvement. We also sought input from the Services as to their expectations for the next 5-year period.

It is within this context that we prepared the presentation and supplemental reports, to meet our contractual obligation for the 5-year HCP comprehensive review. This document brings together the reports from various programs (which were a partial basis for the presentation), the presentation itself and the ensuing discussion notes.

Although each section may be read and understood separately, studying the report together with the slides and meeting minutes can provide a broader context.

### **Goals and Objectives**

We had several major goals and objectives for this 5-year HCP Comprehensive Review, including:

- Review current progress on implementation of the Habitat Conservation Plan
- Provide status updates on the conservation strategies

- Discuss priorities for the next 5-year period
- Receive input from USFWS and NOAA Fisheries
  - Successes that have been achieved
  - Challenges that have been faced
  - Areas that may need improvement

**Outline of Topics**

- Land Base Changes Due to Transactions
- Summary of Timber Management Activities
- Natural Areas Contributions
- Implementation Planning
- Status of OESF Road Maintenance and Abandonment Planning
- Northern Spotted Owl
- Marbled Murrelets
- Other Species
- Monitoring and Research
- Type 5 Stream Research
- Funding for Monitoring and Research
- Implementation, Effectiveness and Validation Monitoring
- Strengthening HCP Implementation

**General Note**

Throughout this document, we frequently refer to the HCP or reference “DNR 1997”. These references are to the Final Habitat Conservation Plan (HCP) written by the Washington State Department of Natural Resources (DNR) and published in 1997.

## **Chapter 1: Land Base Changes Due to Transactions**

Figures 1.1 and 1.2 show DNR's changing land ownership during the first 5 years of the HCP.

Figures 1.3, 1.4, and 1.5 show changes in NRF and Dispersal land owned by DNR in areas covered by the HCP.

Figure 1.1: Baseline DNR ownership in areas covered by the HCP - 1997

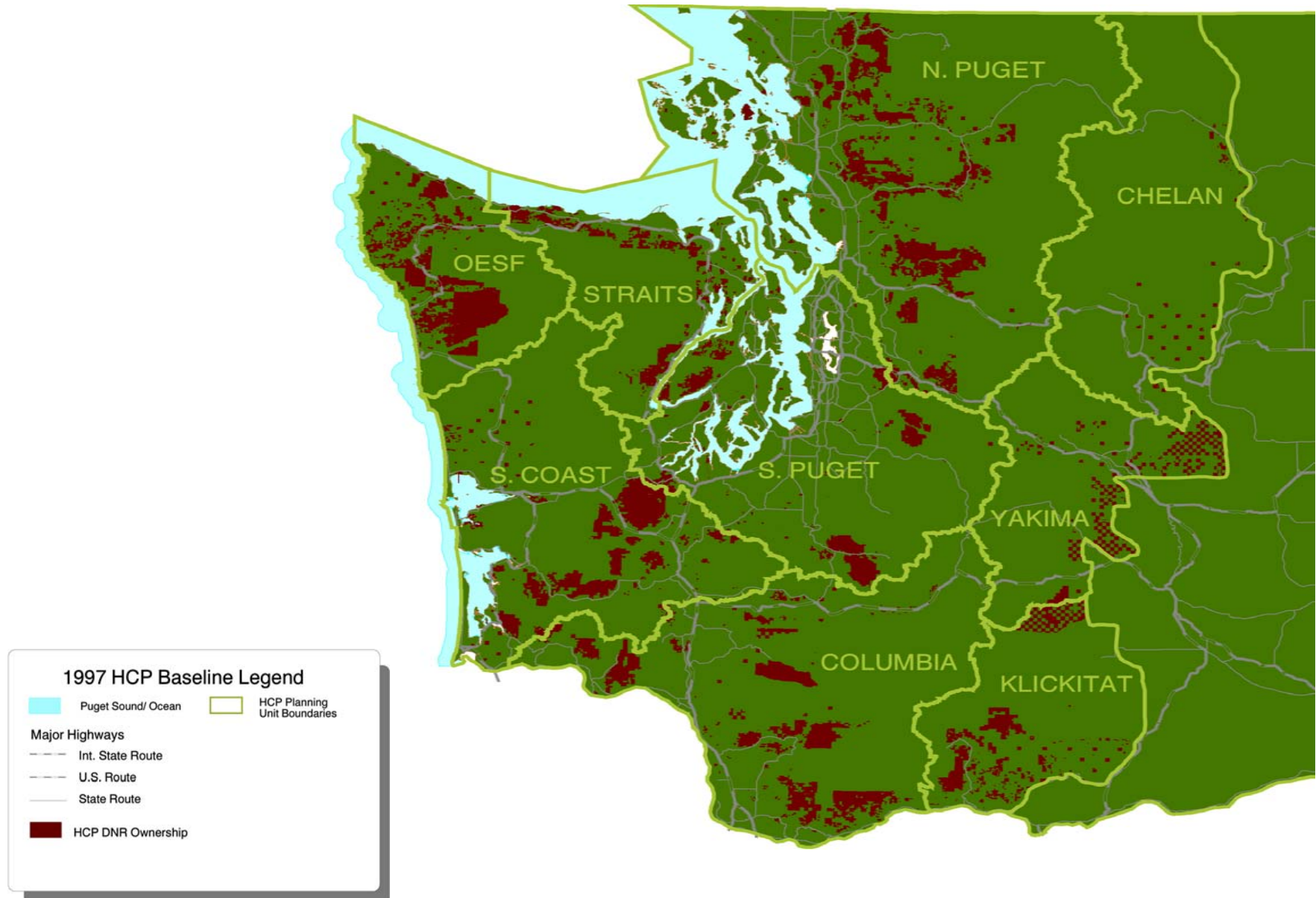


Figure 1.2: DNR ownership in areas covered by the HCP – 2003

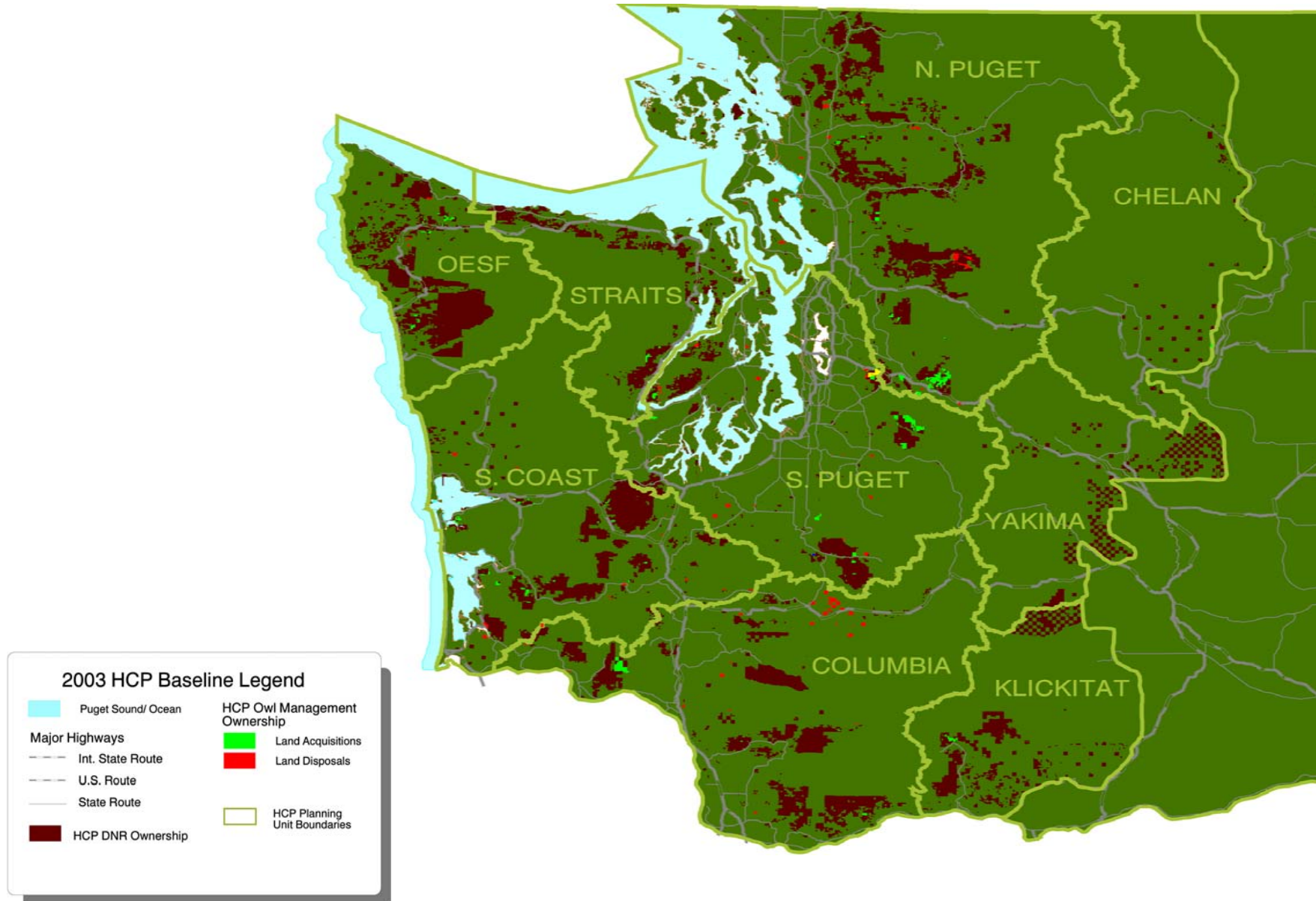




Figure 1.3: NRF and Dispersal lands - 1997

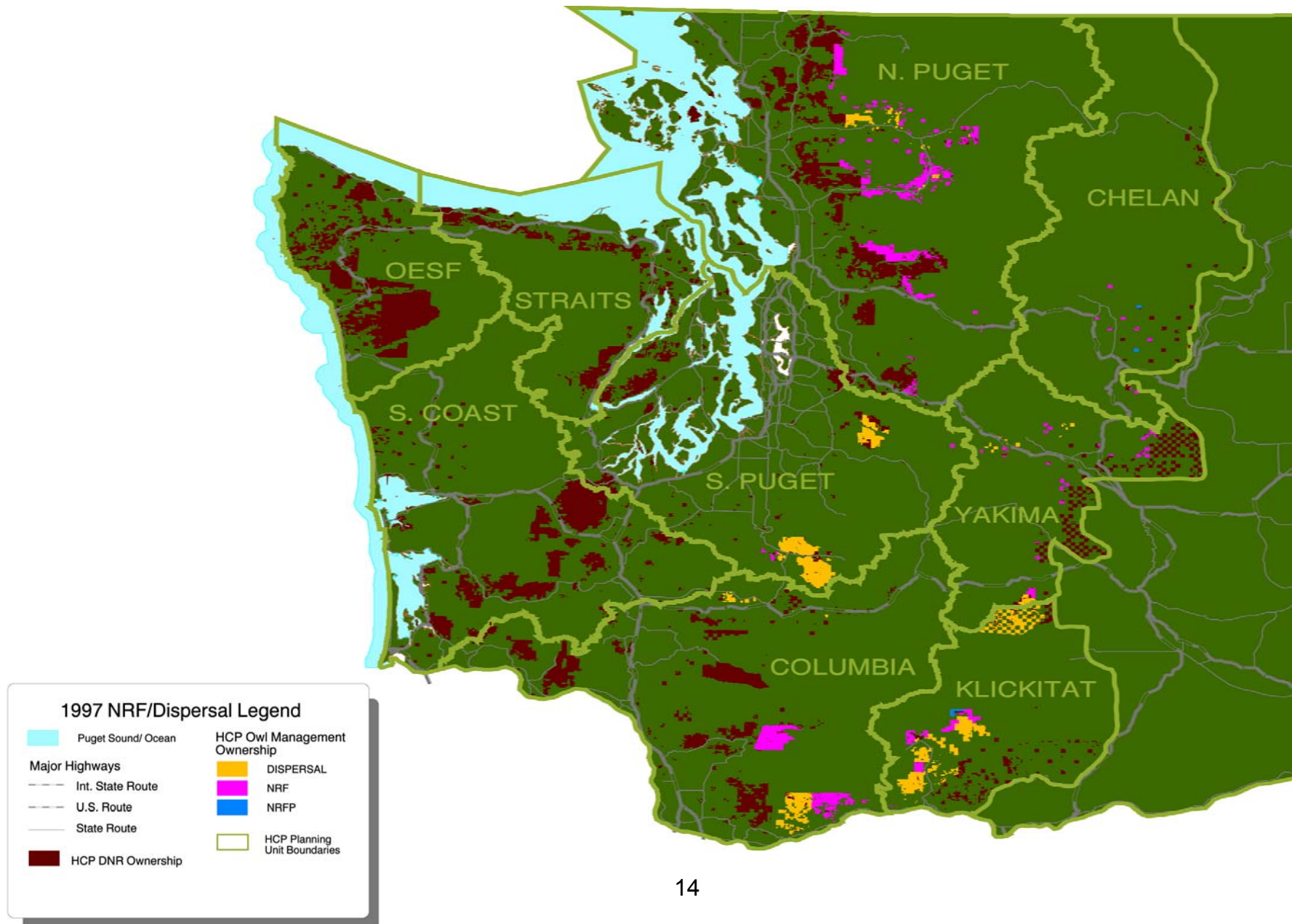


Figure 1.4: NRF lands - 2003

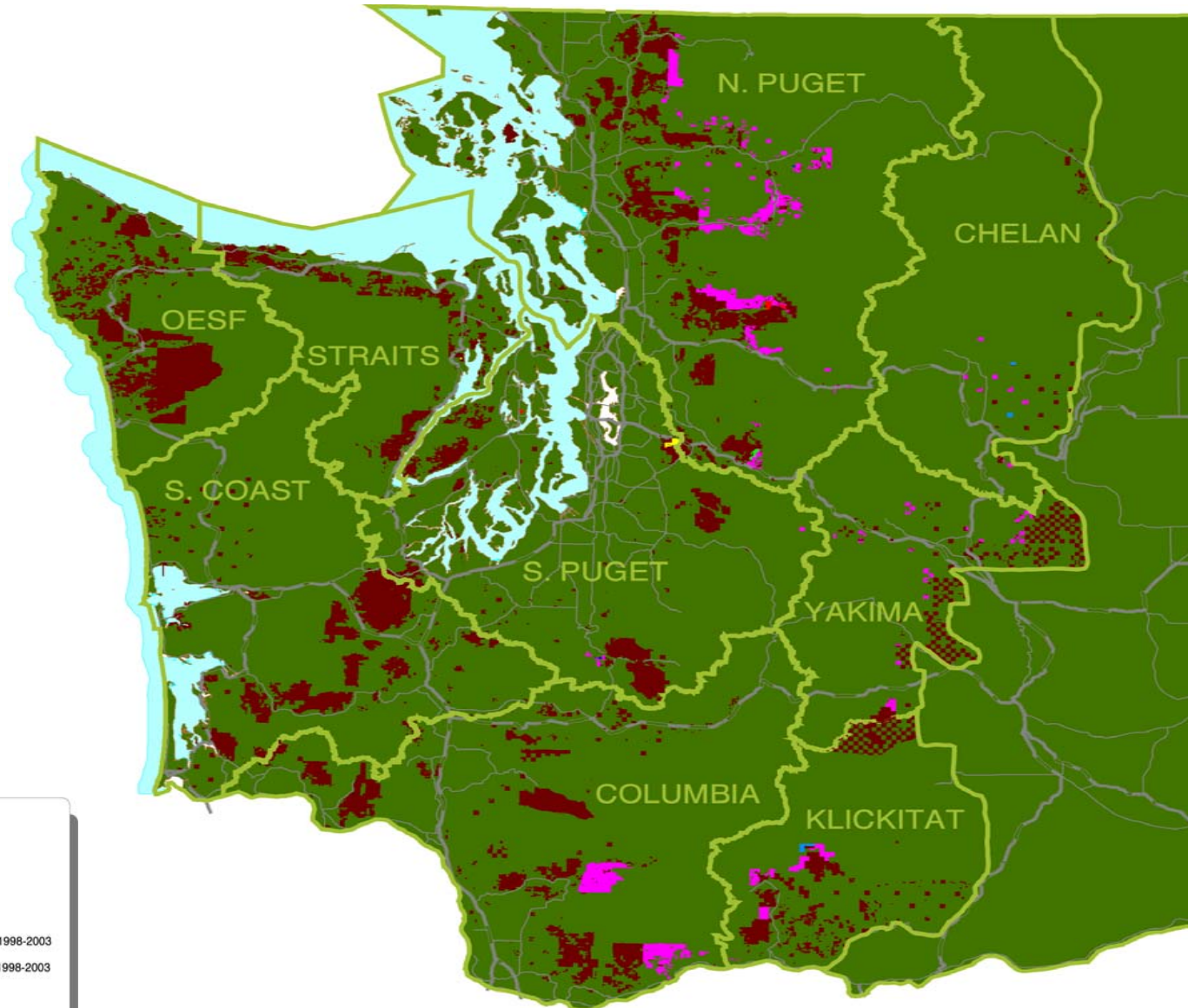
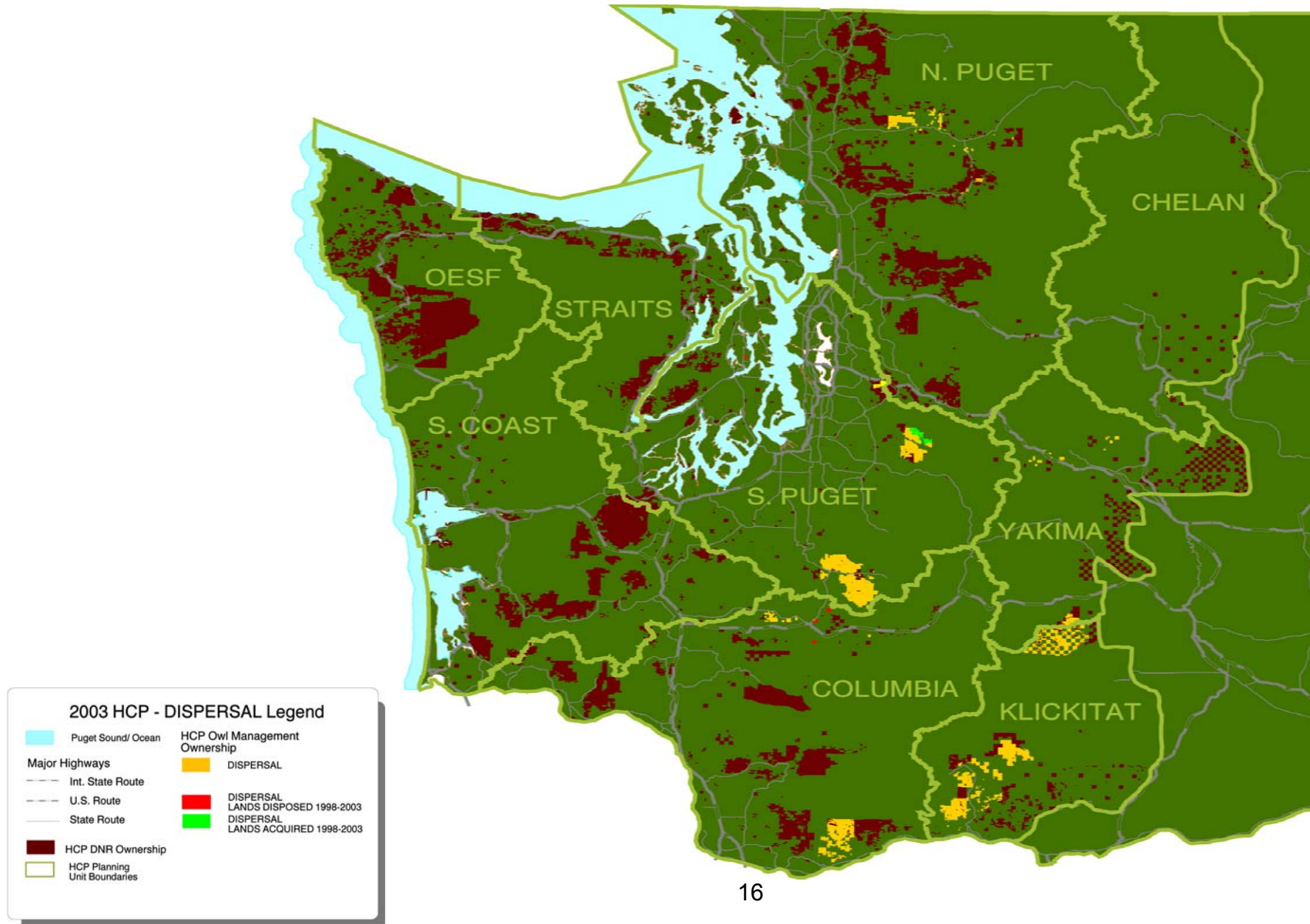




Figure 1.5: Dispersal lands - 2003





## Chapter 2: Timber Management Activities

**Table 2.1: Estimated amount of forest land management activities on DNR-managed lands in the area covered by the HCP during the first decade of the HCP vs. actual numbers for the first five years. Adapted from HCP Table IV.15 (p. IV.211).**

Activity	East-side planning units (acres) - estimate	Actual acres through first five years <sup>1</sup>	West-side planning units (acres) – estimate	Actual acres through first five years <sup>1</sup>	OESF planning unit (acres) – estimate	Actual acres through first five years <sup>1</sup>
<b>Harvest:</b> clearcut	3,000-6,000	<b>1,682</b>	140,000-165,000	<b>45,788</b>	3,000-15,000	<b>1,378</b>
seed tree	0	<b>599</b>	500-1,000	<b>0</b>	0-300	<b>0</b>
shelterwood	1,000-5,000	<b>1,934</b>	1,000-5,000	<b>956</b>	300-1,000	<b>247</b>
selective	25,000-35,000	<b>5,982</b>	20,000-30,000	<b>5,797</b>	8,000-11,300	<b>0</b>
salvage	5,000-10,000	<b>1,182</b>	0	<b>260</b>	1,500-2,500	<b>382</b>
commercial thinning	4,000-10,000	<b>4,078</b>	30,000-45,000	<b>14,702</b>	25,000-35,000	<b>4,102</b>
<b>Site Preparation:</b> broadcast burn	0-1,000	<b>0</b>	500-1,000	<b>33</b>	0-1,000	<b>0</b>
herbicide	500-5,000	<b>1,518</b>	5,000-10,000	<b>6,600</b>	0	<b>0</b>
scarification	2,000-8,000	<b>1,213</b>	1,000-3,000	<b>226</b>	0-1,000	<b>0</b>
<b>Regeneration:</b> planting	6,000-20,000	<b>6,384</b>	120,000-160,000	<b>55,339</b>	3,000-15,000	<b>3,365</b>
natural seeding	30,000-50,000	<b>250</b>	5,000-30,000	<b>240</b>	800-1,200	<b>63</b>
<b>Vegetation management:</b> hand slashing	0	<b>682</b>	60,000-100,000	<b>45,392</b>	5,000-10,000	<b>3,534</b>
ground herbicide	0	<b>3,539</b>	40,000-50,000	<b>13,439</b>	0-1,000	<b>364</b>
aerial herbicide	5,000-15,000	<b>1,327</b>	20,000-30,000	<b>13,639</b>	0-500	<b>0</b>
<b>Forest health:</b> underburning	3,000-10,000	<b>0</b>	0	<b>40</b>	0-500	<b>0</b>
root-rot control	1,000-5,000	<b>0</b>	2,500-5,000	<b>0</b>	0-500	<b>0</b>
insect damage control	2,000-15,000	<b>3,618</b>	0	<b>0</b>	0-500	<b>0</b>
<b>Precommercial Thinning</b>	3,000-10,000	<b>3,332</b>	100,000-200,000	<b>34,983</b>	10,000-25,000	<b>19,087</b>

Activity	East-side planning units (acres) – estimate	Actual acres through first five years	West-side planning units (acres) – estimate	Actual acres through first five years	OESF planning unit (acres) – estimate	Actual acres through first five years
<b>Fertilization</b>	4,000- 10,000	<b>0</b>	30,000- 115,000	<b>13,235</b>	0-1000	<b>0</b>

<sup>1</sup>Actual acres through fiscal year 2003 from Planning & Tracking data compiled yearly for HCP annual reports

### Chapter 3: Natural Areas Contributions

Scott Pearson, WA DNR

Washington State Department of Natural Resource's Natural Areas Program manages approximately 117,475 acres in 49 Natural Area Preserves (NAP) and 28 Natural Resources Conservation Areas (NRCA). This statewide system of natural areas was established by the Washington Legislature to protect native ecosystems and rare plant and animal species or unique natural features. The lands protected in the natural areas system include Puget prairies, estuaries, native forests, bogs, ponderosa pine forests, shrub steppe communities, and significant geological features. These lands provide opportunities for research, education and, where appropriate, low impact public use. In addition, these lands provide important contributions to statewide conservation priorities and to DNR's HCP obligations.

Since DNR and the Services signed the HCP in 1997, the Natural Areas Program has protected an additional 43,627 acres of natural areas. Approximately 16,718 of these acres fall within the area covered by the HCP (See Figs 3.1-3.3 and Table 3.4).

Washington's natural areas contain habitat for 12 species listed as Threatened or Endangered under the Endangered Species Act. Ten of these species are known to occur on natural areas within the area covered by the HCP (Table 3.1), the Canada Lynx is found on a NRCA east of the HCP lands, and several natural areas provide suitable habitat for the Grizzly Bear. The federally listed species on natural areas include the largest and healthiest population of the golden paintbrush (*Castilleja levisecta*), the largest and most viable population of Wenatchee Mountain checker-mallow (*Sidalcea oregana* var. *calva*), over 15 established territories for the northern spotted owl, winter roost and nest sites for the bald eagle, and waters that contain listed runs of Chinook, chum, steelhead and bull trout. Ten of our preserves contain occupied marbled murrelet sites and South Nemah NRCA has more than 30 murrelet occupancies recorded, a known murrelet nest and is the site used to train all the technicians doing murrelet surveys in the state.

**Table 3.1: List of Threatened and Endangered species found on NAPs and NRCAs within the area covered by the HCP**

Species	Federal Status	Natural Area
Northern spotted owl <sup>1</sup>	Threatened	Camas Meadows NAP, Granite Lakes NRCA, Skagit Bald Eagle NAP, South Nemah NRCA, Table Mountain NRCA, Teal Slough NRCA, Trout Lake NAP, Morning Star NRCA, Mt. Pilchuck NRCA
Marbled murrelet <sup>2</sup>	Threatened	Bone River NAP, Clearwater Bogs NAP, Clearwater Corridor NRCA, Elk River NRCA, Niawiakum River NAP, South Nemah NRCA, South Nolan NRCA, Teal Slough NRCA, Willapa Divide NAP, Mt. Pilchuck NRCA

Species	Federal Status	Natural Area
Bald eagle	Threatened	Bone River NAP, Castle Rock NAP, Cattle Point NRCA, Chehalis River, Surge Plain NAP, Dabob Bay NAP, Hat Island NRCA, Niawiakum River NAP, Point Doughty NAP, Sand Island NAP, Shipwreck Point NRCA, Skagit Bald Eagle NAP, Skookum Inlet NAP, Whitcomb Flats NAP, Woodard Bay NRCA, Kennedy Creek NAP
Bull trout	Threatened	Chehalis River Surge Plain NAP, Carlisle Bog NAP, Olivine Bridge NAP, Skagit Bald Eagle NAP, Morning Star NRCA
Chinook salmon – Puget Sound	Threatened	Kitsap Forest NAP, Mt. Si NRCA, West Tiger Mountain NRCA, Olivine Bridge NAP, Skagit Bald Eagle NAP
Chinook salmon – Lower Columbia	Threatened	Klickitat Canyon NRCA
Steelhead – Lower Columbia	Threatened	Klickitat Canyon NRCA, Table Mountain NRCA
Golden paintbrush	Threatened	Rocky Prairie NAP
Wenatchee Mtn. checker-mallow	Endangered	Camas Meadows NAP
Swamp sandwort <sup>3</sup>	Endangered	Carlisle Bog NAP

<sup>1</sup>Only sites with established territories included

<sup>2</sup>Only occupied sites included

<sup>3</sup>Reported but not confirmed. Surveys will be conducted in the summer of 2004.

In the future, natural areas may contribute to the recovery of the federally listed grizzly bear. Morning Star, Mt. Pilchuck, and Grieder Ridge NRCAs (26,308 acres) are located within the North Cascades Grizzly Bear Recovery Zone, which is divided into management units called Bear Management Units. The NRCAs are located within the Pilchuck Unit, which is the only unit containing significant acreage of DNR lands. Approximately 54% of the unit consists of DNR lands. Consequently, the lands within these contiguous NRCAs may significantly contribute to the recovery of the grizzly bear within this Bear Management Unit. Although not within the area covered by the HCP, the 24,672-acre Loomis NRCA (established in January 2000) will also contribute to grizzly bear recovery and provides habitat for a healthy population of Canada lynx (federally Threatened).

Natural areas provide habitat for two federal Candidate species (Table 3.2). Trout Lake NAP contains the second largest population and highest quality native habitat for the Oregon spotted frog. Bald Hill NAP contains one of the largest and highest quality habitats for Taylor's checkerspot butterfly.

Natural areas also provide habitats for other sensitive species (Federal Species of Concern, State-listed, State Candidate, and other sensitive species) identified in the HCP (Table 3.2). These species include insects associated with bogs, like the Beller's ground beetle and Hatch's click beetle, amphibians that depend on forested talus slopes like the Larch Mountain salamander, birds associated with mountain streams and rivers like the

harlequin duck, bats that depend on maternal colonies like the colony found at Woodard Bay NRCA, and mammals that depend on high elevation rocky outcrops and alpine communities like the California bighorn sheep.

**Table 3.2: Special status species (Federal Species of Concern, State-listed, State Candidate or other sensitive species) found in Table III.14 of the Final HCP (DNR 1997) (note that new Federal Candidates within the area covered by the HCP and found on natural areas have been added and any change in species status has also been changed).**

Species	Natural Area <sup>1</sup>
<b>Federal Candidates</b>	
Oregon spotted frog	Trout Lake NAP
Taylor's checkerspot	Bald Hill NAP
<b>Federal Species of Concern</b>	
Beller's ground beetle	Snoqualamie Bog NAP, Kings Lake Bog NAP
Hatch's click beetle	Kings Lake Bog NAP
Larch Mountain salamander	Table Mt. NRCA, Columbia Falls NAP
Tailed frog	Table Mountain NRCA, Mt. Pilchuck NRCA
Cascades frog	Mt. Pilchuck NRCA
Van Dyke's salamander	South Nemah NRCA, Ellsworth Creek NRCA
Northern red-legged frog	Carlisle Bog NAP, North Bay NAP, Table Mountain NRCA, Mt. Pilchuck NRCA, Ellsworth Creek NRCA, Kings Lake Bog NAP
Columbia torrent salamander	Ellsworth Creek NRCA
Peregrine falcon	Table Mountain NRCA, Cypress Island NAP, Mt. Si NRCA, Elk River NRCA, Hat Island NRCA, Lummi Island NRCA, North Bay NAP
Northern goshawk	Clearwater Corridor NRCA, Mt. Pilchuck NRCA
Harlequin duck	Morning Star NRCA
Olive-sided flycatcher	Numerous sites
Fringed myotis	Camas meadows NAP
Yuma myotis	Woodard Bay NRCA
California bighorn sheep	Morning Star NRCA, Grieder Ridge NRCA, Mt. Pilchuck NRCA
<b>State listed – no federal status</b>	
Sandhill crane (State Endangered)	Trout Lake NAP, Klickitat Canyon NRCA
<b>State candidate – no federal status</b>	
Dunn's salamander	Teal Slough NRCA, South Nemah NRCA
Vaux's swift	Numerous sites
Pileated woodpecker	Table Mountain NRCA, Morning Star NRCA, Greider Ridge NRCA, Mt. Pilchuck NRCA, Kitsap Forest NAP, and others
Purple martin	Woodard Bay NRCA, Kennedy Creek NAP
<b>State Sensitive or State Monitor Species</b>	
Olympic mudminnow	Carlisle Bog NAP, Chehalis River Surge Plain NAP, West Tiger Mountain NRCA

Species	Natural Area <sup>1</sup>
Western bluebird	Rocky Prairie NAP, Mima Mounds NAP

<sup>1</sup>Locality information was determined by consulting the following databases: Washington Natural Heritage BCD and the following WDFW databases: Heritage Points, Herp database, Owl database, murrelet database, Priority Habitats and Species and Streamnet.

Late seral forests and trees with potential nesting platforms are important features to two of the primary species included in the HCP, the northern spotted owl and the marbled murrelet. A number of our natural areas were established because of their high quality native forest ecosystems and consequently, they are dominated by mature and/or late seral forests. Several of the preserves and conservation areas in Table 3.3 are dominated by late seral forests (e.g., Clearwater Corridor NRCA and Willapa Divide NAP), others are dominated by natural origin mature forests with old trees and areas of old forests such as South Nemah NRCA, while others are dominated by forests >70 yrs of age that naturally regenerated after the original harvest (e.g., Mt. Si NRCA, West Tiger NRCA and Rattlesnake Mt. Scenic Area). Some of the native forests on our preserves represent some of the highest quality examples of globally imperiled forest ecosystems. For example, Kitsap Forest NAP contains the only protection for one Douglas-fir forest community type and the highest quality example of another.

**Table 3.3: Natural areas located within the area covered by the HCP and composed primarily of mature forests, late seral forests or a combination of mature and late seral forests.**

Natural Area	Natural Area Size (acres)
<b>Coastal</b>	
Kitsap Forest NAP	572
South Nemah NRCA	2,440
Willapa Divide NAP	587
Hendrickson Canyon NAP	159
Ellsworth Creek NRCA	557
Clearwater Corridor NRCA	2,323
South Nolan NRCA	213
<b>Western Cascades</b>	
Skagit Bald Eagle NAP	1,546
Granite Lakes NRCA	603
Morning Star NRCA	10,003
Mt. Pilchuck NRCA	9,540
Greider Ridge NRCA	6,699
<b>Natural Area</b>	
Tiger Mt. NRCA	3,364
Mt. Si NRCA	9,522
Rattlesnake Mt. Scenic Area	1,771
Table Mt. NRCA	2,837
Columbia Falls NAP	514
<b>Eastern Cascades</b>	
Monte Cristo NAP	1,151
Klickitat Canyon NRCA	470
<b>Total</b>	<b>54,937</b>

In the Natural Areas Program there are five high quality estuaries including three on the coast (Elk River NRCA, Bone River NAP, and Niawiakum River NAP) and two in Puget Sound (Skookum Inlet and Kennedy Creek NAPs). These sites protect high quality and rare saltmarsh communities. Estuaries also provide important foraging and cover habitat for anadromous fish and they provide important habitat for these species during the critical transition from a freshwater to marine environment. In addition, estuaries help dissipate potentially damaging wave energy before it reaches the land, they provide a sink for sediments and wastes derived from both land and sea, and they are some of the most biologically productive systems in the world.

There are methods other than the federal Endangered Species listing process for setting conservation priorities. Selection of potential NAPs is driven by priorities established within the State of Washington *Natural Heritage Plan*. The Natural Heritage Program is responsible for assigning priorities in the Plan to ecological communities and to rare plant and animal species.

In addition to assigning priorities to species and ecological communities for the purposes of identifying potential NAPs, the Natural Heritage Program uses a ranking scheme developed by NatureServe. NatureServe is a network of more than 70 Natural Heritage Programs throughout the western hemisphere. The ranking scheme was developed to determine relative imperilment or conservation status of plants, animals and ecological communities. Each community and species is assigned one global rank (called a G-rank), which refers to the element's rank across its entire range. The ranks consist of whole numbers between 1 and 5. According to this rank, a species or community with a rank of G1 would be critically imperiled throughout its entire range and a rank of G5 indicates that the element is demonstrably widespread, abundant, and secure. On natural areas, there are two populations of globally imperiled species (Howell's daisy and Oregon sullivantia; G1 and G2). Neither of these species is listed under the federal Endangered Species Act. In addition there are 26 occurrences of globally imperiled (G1 and G2) ecological communities within the area covered by the HCP. These ecological communities are globally imperiled because of rarity or because of some factor(s) making it very vulnerable to extinction or elimination. Imperiled communities typically consist of 6 to 20 occurrences or very few acres (2,000 to 10,000). Currently, there is no federal protection for imperiled ecological communities.

Because our inventory of the State's biodiversity is incomplete, the protection of a broad representation of ecological communities within natural areas also contributes to the conservation of many species. For example, Bald Hill NAP was established to protect rare and high quality plant communities. After Bald Hill was protected, we learned that it also provides habitat for one of the last relatively healthy populations of a Federal Candidate butterfly, Taylor's checkerspot. Similarly, North Bay NAP was established to protect high quality wetland features and we later found that it contains one of three known populations of the Makah copper butterfly in the world.

To date, over 250 research, inventory, and monitoring projects have been conducted on natural areas by agency biologists and by university professors and their students. Several ongoing research projects are helping us identify critical habitat features for species like the golden paintbrush, Taylor's checkerspot, Oregon spotted frog, and the Wenatchee Mountain checker-mallow. In addition, research conducted on natural areas is helping us develop new techniques for restoring rare ecological communities like Puget prairies. An ongoing study examining techniques such as fire, mowing and carbon addition may help us reduce the cover of non-native species on the few remaining prairies.

Taken together, this information demonstrates the important contribution of DNR's natural areas to the protection of biodiversity and to the Department's HCP obligations.

**Table 3.4: Size of each natural area in 1997 when the HCP was signed, the number of acres added since 1997, and current acreage.**

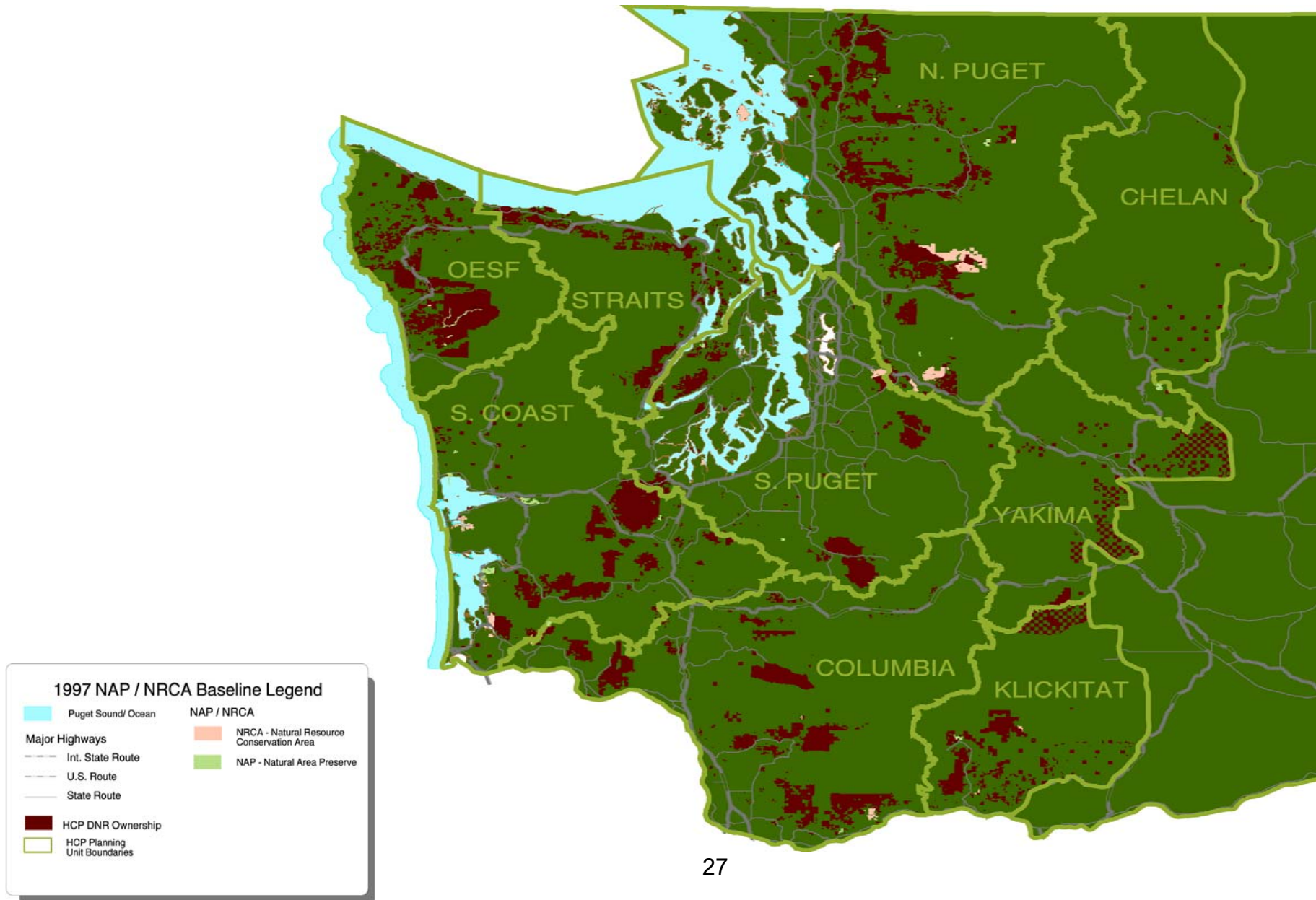
Natural Area	Natural Area Preserve (NAP) or Natural Resources Conservation Area (NRCA)	County	January 1997 Acres	Acres acquired since Jan. 1997	Current Acres
<b>Natural Areas within area covered by HCP</b>					
Bald Hill	NAP	TH	313.75		313.75
Bone River	NAP	PA	2,444.00	121.02	2,565.02
Camas Meadows	NAP	CH	1,133.48	203.77	1,337.25
Carlisle Bog	NAP	GH	310.00		310.00
Cattle Point	NRCA	SJ	93.10	19.00	112.10
Chehalis River Sp	NAP	GH	2,283.77	359.72	2,643.49
Clearwater Bogs	NAP	JE	504.17		504.17
Clearwater Corridor	NRCA	JE	2,323.00		2,323.00
Columbia Falls	NAP	SKA	513.97		513.97
Cypress Highlands	NAP	SKT	1,072.38		1,072.38
Cypress Island	NRCA	SKT	3,625.92	306.84	3,932.76
Dabob Bay	NAP	JE	348.04	7.75	355.79
Dailey Prairie	NAP	WHA	218.10	10.75	228.85
Devils Lake	NRCA	JE	0.00	80.00	80.00
Elk River	NRCA	GH	3,401.39	960.53	4,361.92
Ellsworth Creek	NRCA	PA	0.00	557.00	557.00
Goose Island	NAP	GH	12.00		12.00
Granite Lakes	NRCA	SKT	603.25		603.25
Greider Ridge	NRCA	SN	5,469.24	1,230.00	6,699.24
Gunpowder Island	NAP	PA	152.00		152.00
Hat Island	NRCA	SKT	91.25		91.25
Hendrickson Canyon	NRCA	WAH	0.00	159.00	159.00
Kennedy Creek	NAP	MA	56.10	107.60	163.70
Kings Lake Bog	NAP	KG	309.22		309.22



Natural Area	Natural Area Preserve (NAP) or Natural Resources Conservation Area (NRCA)	County	January 1997 Acres	Acres acquired since Jan. 1997	Current Acres
Kitsap Forest	NAP	KIP	0.00	571.91	571.91
Klickitat Scenic River	NRCA	YA	470.00		470.00
Lake Louise	NRCA	WHA	137.70		137.70
Lummi Island	NRCA	WHA	661.47		661.47
Merrill Lake	NRCA	COW	114.20		114.20
Mima Mounds	NAP	TH	444.85	179.00	623.85
Monte Cristo	NAP	KL	0.00	1,151.00	1,151.00
Morning Star	NRCA	SN	7,836.65	2,166.00	10,002.65
Mt Pilchuck	NRCA	SN	9,540.06	66.00	9,606.06
Mt Si	NRCA	KG	7,984.69	1,537.60	9,522.29
Niawiakum River	NAP	PA	796.77	40.97	837.74
North Bay	NAP	GH	673.25	424.87	1,098.12
Oak Patch	NAP	MA	17.30		17.30
Olivine Bridge	NAP	SKT	148.03		148.03
Point Doughty	NAP	SJ	56.55		56.55
Rattlesnake Ridge	NRCA	KG	1,771.43		1,771.43
Rocky Prairie	NAP	TH	35.00		35.00
Sand Island	NAP	GH	8.00		8.00
Shipwreck Point	NRCA	CLM	471.80		471.80
Shumocher Creek	NAP	MA	0.00	466.33	466.33
Skagit Bald Eagle	NAP	SKT	1,546.01		1,546.01
Skookum Inlet	NAP	MA	105.63	37.00	142.63
Snoqualmie Bog	NAP	KG	79.54	31.00	110.54
South Nemah	NRCA	PA	1,452.50	987.00	2,439.50
South Nolan	NRCA	JE	213.00		213.00
Table Mtn	NRCA	SKA	2,516.59	320.00	2,836.59
Teal Slough	NRCA	PA	8.40		8.40
Trout Lake	NAP	KL	40.56	1,532.45	1,573.01
West Tiger Mtn	NRCA	KG	981.19	2,661.02	3,642.21
Whitcomb Flats	NAP	GH	5.00		5.00
White Salmon Oak	NRCA	KL	315.29		315.29
Willapa Divide	NAP	PA	272.00	315.00	587.00
Woodard Bay	NRCA	TH	570.20	107.71	677.91
<b>Totals</b>			<b>64,551.79</b>	<b>16,717.84</b>	<b>81,269.63</b>
<b>Natural Areas Outside The Area Covered By The HCP</b>					
Badger Gulch	NAP	KL	180.00		180.00
Barker Mt	NAP	OK	120.00		120.00
Castle Rock	NAP	GR	81.25		81.25

Natural Area	Natural Area Preserve (NAP) or Natural Resources Conservation Area (NRCA)	County	January 1997 Acres	Acres acquired since Jan. 1997	Current Acres
Chopaka	NAP	OK	2,764.50		2,764.50
Cleveland Shrub Steppe	NAP	KL	277.50	362.50	640.00
Columbia Hills	NAP	KL	3,433.64	160.00	3,593.64
Davis Canyon	NAP	OK	293.00		293.00
Dishman Hills	NRCA	SPK	70.00		70.00
Entiat Slopes	NAP	CH	640.00	1,279.98	1,919.98
Kahlotus Ridgetop	NAP	FR	239.59		239.59
Little Pend Oreille River	NAP	ST	253.14	37.00	290.14
Loomis State Forest	NRCA	OK	0.00	24,672.00	24,672.00
Marcellus Shrub Steppe	NAP	AD	122.22		122.22
Methow Rapids	NAP	OK	66.00		66.00
Pinecroft	NAP	SPK	100.19		100.19
Riverside Breaks	NAP	OK	36.35		36.35
Selah Cliffs	NAP	YA	64.67	42.59	107.26
Spring Creek Canyon	NAP	LI	235.00		235.00
Two Steppe	NAP	DGL	0.00	355.00	355.00
Upper Dry Gulch	NAP	CH	320.00		320.00
<b>Totals</b>			<b>9,297.05</b>	<b>26,909.07</b>	<b>36,206.12</b>
<b>Grand Total</b>			<b>73,848.84</b>	<b>43,626.91</b>	<b>117,475.75</b>

Figure 3.1: NAP and NRCA lands - 1997



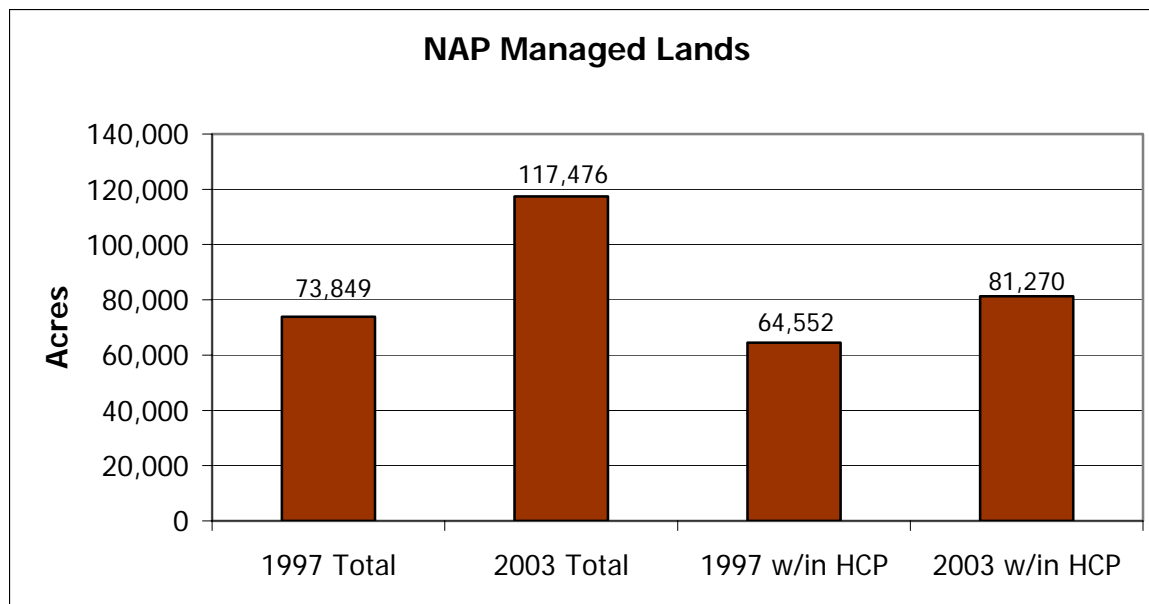
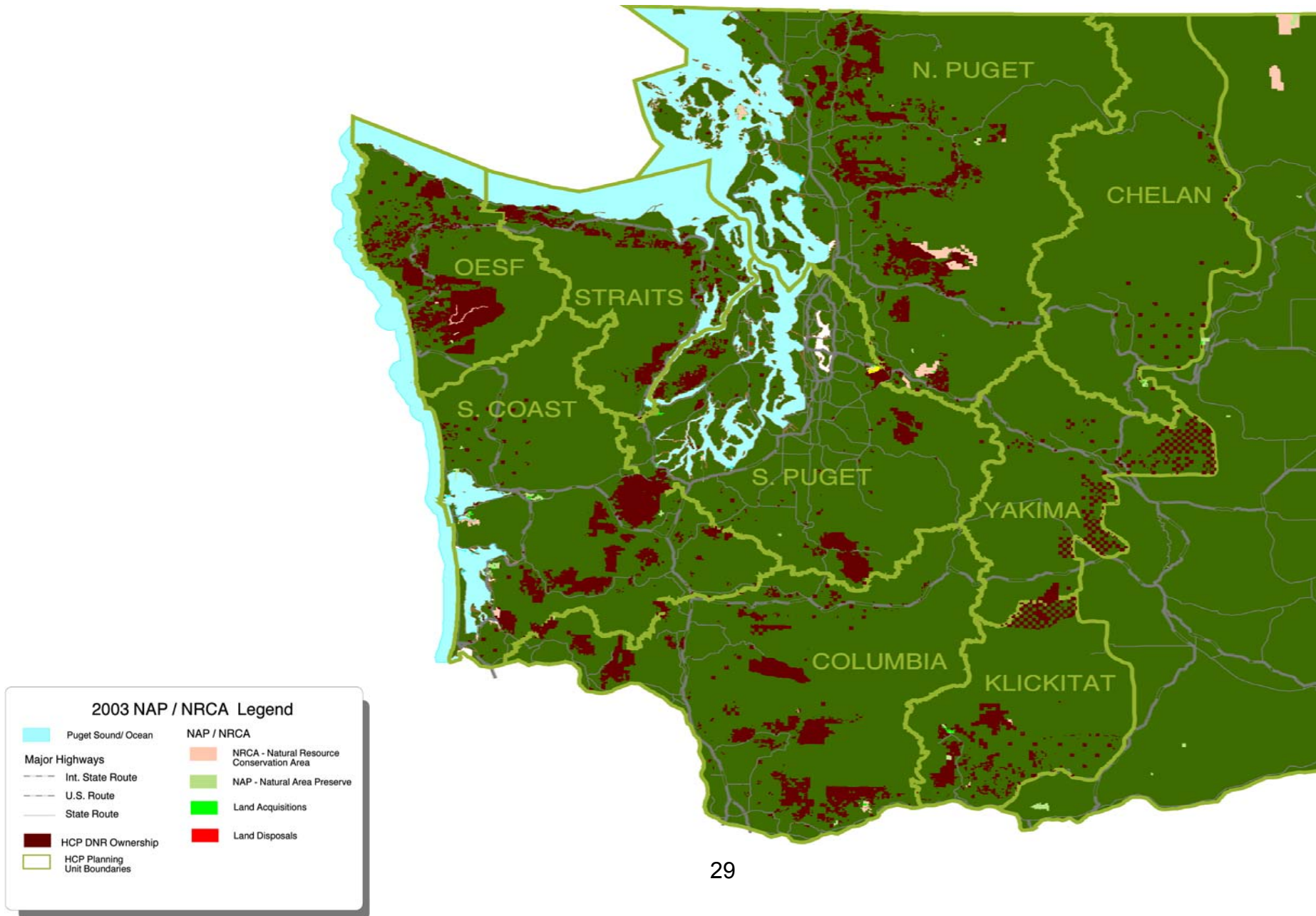
**Figure 3.2: Growth of Natural Areas Program lands between 1997 and 2003.**

Figure 3.3: NAP and NRCA lands - 2003



## Chapter 4: Implementation Planning

**The purpose of an implementation plan is to answer three questions about forest management:**

1. What type of activities can we implement across a landscape?
2. Where in the landscape can we implement these activities? (i.e. harvest, recreation, land transactions, NAPs, NRCAs)
3. What will be the combined effects of implementing these activities over time across the landscape?

**What is the difference between Sustainable Forestry Implementation Plans and Landscape Plans?**

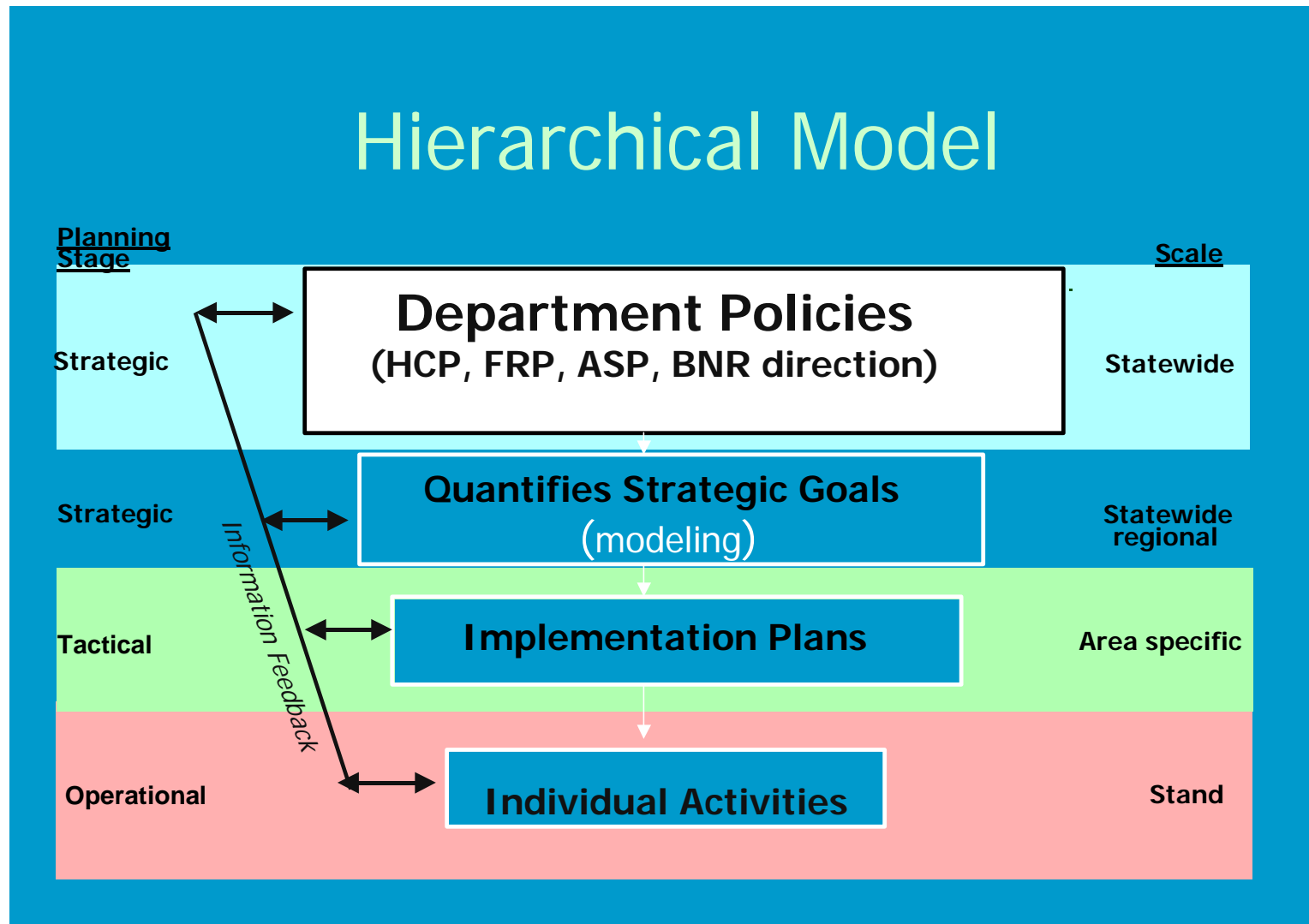
*Landscape Plans – Current Process (107 plans)*

- Focus on management objectives for a specific area of need
- Bottom up approach to develop objectives
- Based on up-front assessment work
- Scale (few hundred acres to several thousand acres)
- Timing (10-year plan)
- SEPA analysis on management objectives (e.g. Lake Whatcom, Loomis)

*Implementation Plans (6 plans – Westside)*

- Focus on developing strategies and schedules to meet policy goals (HCP, FRP, BNR Policies, Procedures & Standard Practice Memorandums)
- Scale (HCP Planning Units)
- A comprehensive broad approach that includes a description of the specific policy objectives, opportunities and constraints and a proposed schedule of activities
- Top down approach to set objectives
- Bottom-up approach to set strategies
- Based on capturing what we know today and scheduling future activities
- Ability to incorporate previous planning work and plans
- Timing (10-year plan)
- SEPA analysis

Figure 4.1: Relationship of implementation planning to department policies, goals, and objectives



## **Chapter 5: Status of OESF Road Maintenance and Abandonment Planning**

### **Rationale:**

**WAC 222-24-051 Road maintenance schedule.** All forest roads must be covered under an approved road maintenance and abandonment plan within 5 years of the effective date of this rule or by December 31, 2005.

### **Background:**

Olympic Region began its Road Maintenance and Abandonment Plan (RMAP) program during the spring of 2000. A schedule was developed in which ~20% of the State forest roads are analyzed annually for 5 years, with an anticipated completion date in the fall of 2005. An RMAP is being developed and submitted for approval for each of the 17 Landscape Planning Units in the Olympic Region. Eleven of the 17 Landscape Planning Units constitute the OESF.

### **Data:**

- 1,723 miles of state forest road in the OESF
- 9 of 11 RMAPs in the OESF submitted and approved by Forest Practices
- 1,286 miles (75%) of state forest road are under an approved RMAP
- 1 additional RMAP will be submitted to Forest Practices by Winter, 2004
- Final RMAP in the OESF will be submitted for approval by Winter, 2005

### **Detailed Summary:**

- Willy-Huel Landscape: RMAP dated February 14, 2001 submitted and approved
- Upper Sol Duc Landscape: RMAP dated November 20, 2001 submitted and approved
- Kalaloch Landscape: RMAP dated December 3, 2001 submitted and approved
- Sekiu Landscape: RMAP dated December 20, 2001 submitted and approved
- Reade Hill Landscape: RMAP dated May 1, 2002 submitted and approved
- Clallam River Landscape: RMAP dated December 1, 2002 submitted and approved
- Goodman Creek Landscape: RMAP dated December 15, 2002 submitted and approved
- Queets Landscape: RMAP dated December 1, 2003 submitted and approved
- Dickodochtedar Landscape: RMAP dated December 29, 2003 submitted and approved
- Upper Clearwater Landscape: RMAP to be submitted by Winter, 2004
- Coppermine Landscape: RMAP to be submitted by Winter, 2005



## **Chapter 6: Northern Spotted Owl**

Teodora Minkova, WA DNR

### **What is the current approach and method to verify NRF habitat per WAU?**

Assessment of NRF and dispersal habitat is based on DNR Forest Resource Inventory System. The latest inventory (FRIS2) was modeled (grown) in 2003 from the original field samplings (FRIS1) conducted between 1991 and 1998. Very limited number of DNR-managed stands (called forest inventory units or polygons) is not FRIS inventoried (about 15%) and in these cases LULC coverage (the older inventory system) was used. DNR continues to field survey these polygons and the new data are continuously added to FRIS2 database.

FRIS2 data for the polygons within designated NRF and dispersal management areas were queried to check which Forest Resource Inventory Units (polygons) meet the HCP definitions' threshold values. Polygons within designated NRF management areas that meet all six required thresholds of the submature NRF definition were determined as actual habitat. Polygons within designated dispersal management areas that meet all three required thresholds of the dispersal definition were determined as actual habitat.

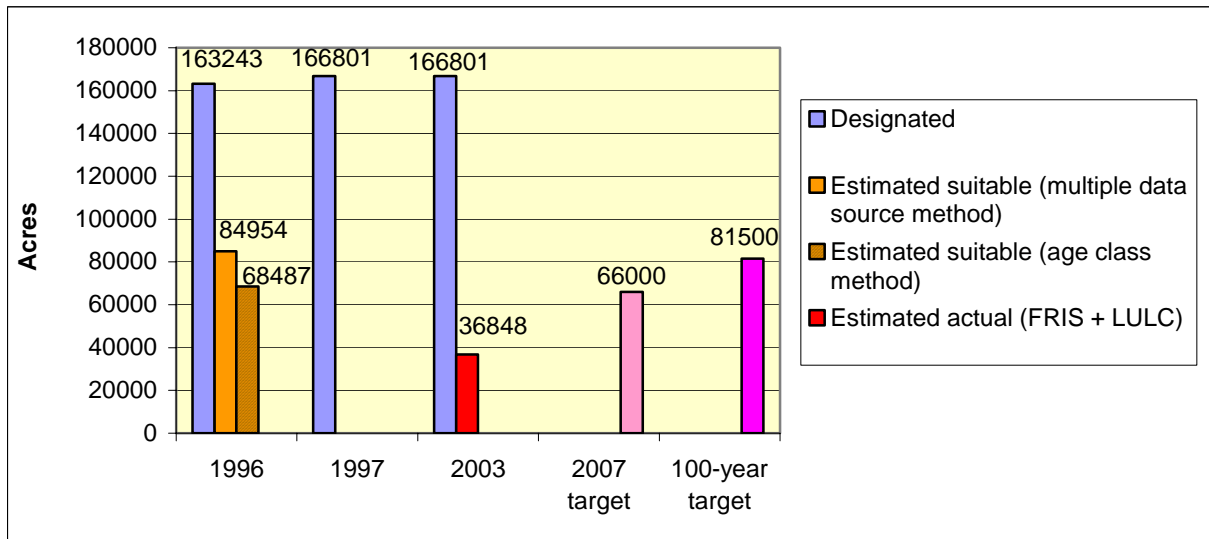
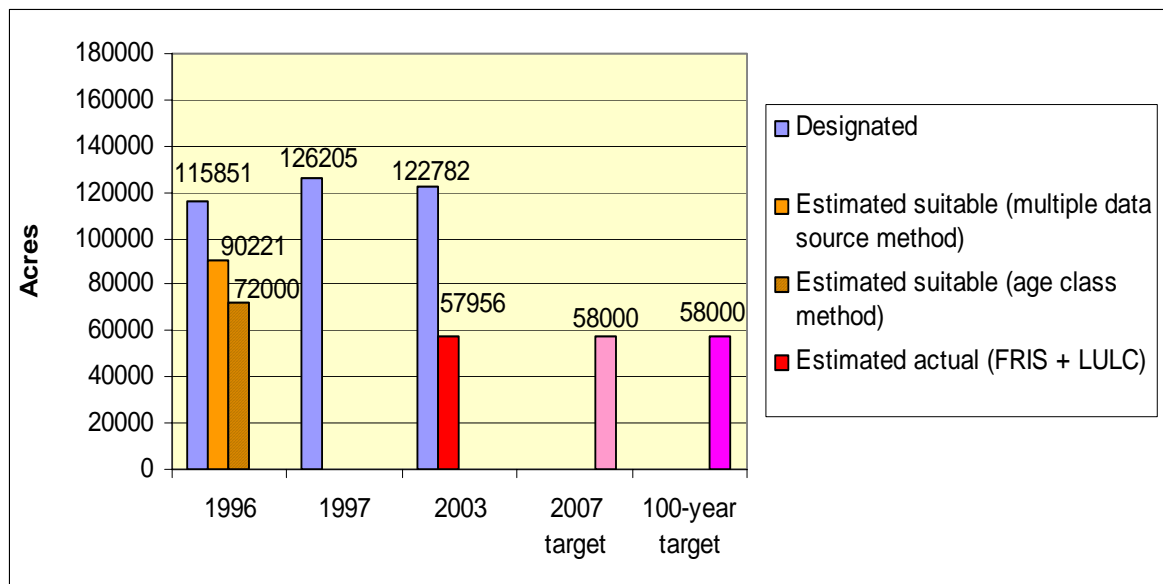
The percentage of all "yes" polygons per designated area in each WAU was calculated by intersecting the FRIS layer with GIS layers of owl management, land transaction, WAU\_97, and natural areas.

This habitat delineation was completed only for the Westside planning units. After the HCP administrative amendment for Klickitat PU is approved the calculations for the Eastside will start.

### **What are the amounts of NRF habitat within the designated NRF areas in the state? Is (HCP) table IV.16 still valid?**

See Table 6.3 for the exact habitat acreage per WAU.

The following graphics illustrate the change in the acreage of designated and actual NRF and dispersal habitats for the last 5 years.

**Figure 6.1: NRF habitat in the Westside planning units****Figure 6.2: Dispersal habitat in the Westside planning units**

The amount of the designated NRF and dispersal habitat varies throughout the years because of the land repositions (DNR acquires and disposes of land within designated habitat management areas). That mean that the 50% target that DNR has to maintain at any time also varies.

In both graphs the estimated “suitable habitat” in 1996 was substantially higher compared to 2003 estimates. Several factors contribute to this difference:

- Two methods have been used to estimate the amount of suitable owl habitat in 1996 DEIS analyses. The multiple source method used GIS technology to combine data from satellite photos, Forest Service inventory, WDFW mapping, etc. The age class method was based on DNR inventory of stands age. Both methods were less accurate in inventorying owl habitat compared to FRIS database that is used for the 2003 estimates.
- Despite its better accuracy, FRIS is not the optimal inventory tool for owl habitat assessment. It was initially designed to evaluate timber resources and to plan the harvest levels on DNR-managed lands. The way the polygons are delineated, the size of the polygons, the sampling plots design, etc. lead to underestimation of the suitable NRF and dispersal habitat.
- The requirement for a polygon to meet all the thresholds of the definition in order to be classified as habitat excluded a lot of “near habitat” polygons thus reducing the acreage of the actual habitat.

**What is the status of the research to develop a more precise definition of functional owl nesting habitat at the stand level?**

**Identified problems:**

1. Specific components of the definitions are missing:
  - Upper threshold for the number trees per acre in the definition for dispersal habitat
  - Vertical diversity in NRF definition for the Westside Planning Units
2. Thresholds of some NRF definition variables differ substantially from the values measured around the known reproductively successful owl site centers:
  - Requirements for the amount of DWD and snags are too high in Klickitat
  - Requirement for the tree density are low in Columbia PU
3. Some components of the definitions are difficult to measure in the way they are described in the HCP:
  - Canopy cover in percentages
  - Amount of down woody debris (DWD) as percentage ground cover
4. The requirement for a stand to meet the threshold values for all of parameters included in the habitat definitions results in a very low number of stands qualifying for habitat.

Done so far:

1. DNR translated two of the habitat metrics to format more compatible with its inventory database:
  - Correlation between percentage canopy cover (CC) and Curtis relative density (RD) was established by DNR biometricians in 1999. Currently RD of 50 is used instead of 70% canopy closure
  - Correlation between “percentage ground cover of DWD” and “cubic feet DWD per acre” was established in 1999. Currently 2400 cubic feet of DWD per acre is used instead of 5% ground cover of DWD.
2. Preliminary consultations and literature review have been conducted to explore the idea of developing a multivariate model of owl habitat definitions at stand

- level. The model will allow substituting one component of the definition for another to a certain extent.
3. Two separate teams of DNR wildlife biologists and silviculturists tried to address the problems with the functionality of the current HCP definitions of owl habitat and the adequacy of DNR's inventory (FRIS2) to evaluate the habitat conditions:

***Nesting, roosting, and foraging habitat delineation summary (2002)***

The findings, that only two of the 19 spotted owl site centers located in NRF-management areas in SW Region were identified by FRIS data as being located in NRF habitat and the large discrepancy between the amount of suitable habitat delineated through field surveys in comparison to FRIS data, raised concern that current FRIS does not accurately reflect the location and amount of spotted owl habitat in NRF-management areas. The objective of the study was to identify and describe methodology that would improve the accuracy of habitat delineation. Several alternative methods for habitat evaluation were examined and an integrated method using aerial photos and FRIS plot data were identified as preferred alternative. The analyses pointed to the need for refinement of NRF habitat definition, particularly the thresholds of "trees per acre" criterion and the possibility of identifying habitat criteria as primary and secondary determinants of suitable habitat. *Principal Investigators: Tami Riepe, Florian Deisenhofer, and Doug Wiedemier*

***Structure and composition of spotted owl nesting, roosting, and foraging habitat in the Klickitat District (2003)***

The research addressed the problem that NRF habitat (as defined by the HCP and evaluated using FRIS data) was extremely rare in Klickitat District even though there has been a substantial history of successful reproduction by territorial spotted owls there. A more detailed (field, aerial and FRIS) evaluation of stand characteristics around spotted owl sites with a history of successful reproduction was conducted. It showed that few of these stands meet HCP requirements for abundance of DWD and nearly none has sufficient large snags to meet the definition requirements. The anomalous near-absence of NRF habitat in the presence of reproductively successful owls suggested that the HCP definition of habitat does not accurately describe habitat as recognized by the animals themselves. It was proposed to explore the idea of using multivariate model of habitat definition where threshold value defining habitat is a composite function of multiple parameters. It was suggested to review threshold values for the snags and DWD component of the definition and explore the idea of two sets of values – "minimum acceptable levels" and "desired future conditions". *Principal Investigators: Scott Horton, Steve Wetzel*

**What is the status of adjusting the NRF area boundaries in the North Puget Planning Unit?**

No boundary adjustments have been made in North Puget Planning Unit.

**Baseline validation monitoring of northern spotted owl**

DNR conducted annual monitoring of spotted owl occupancy, abundance and reproduction in OESF and Eastside Planning Units. There are no monitoring data available for the Westside Planning Units.

### **Olympic Experimental State Forest**

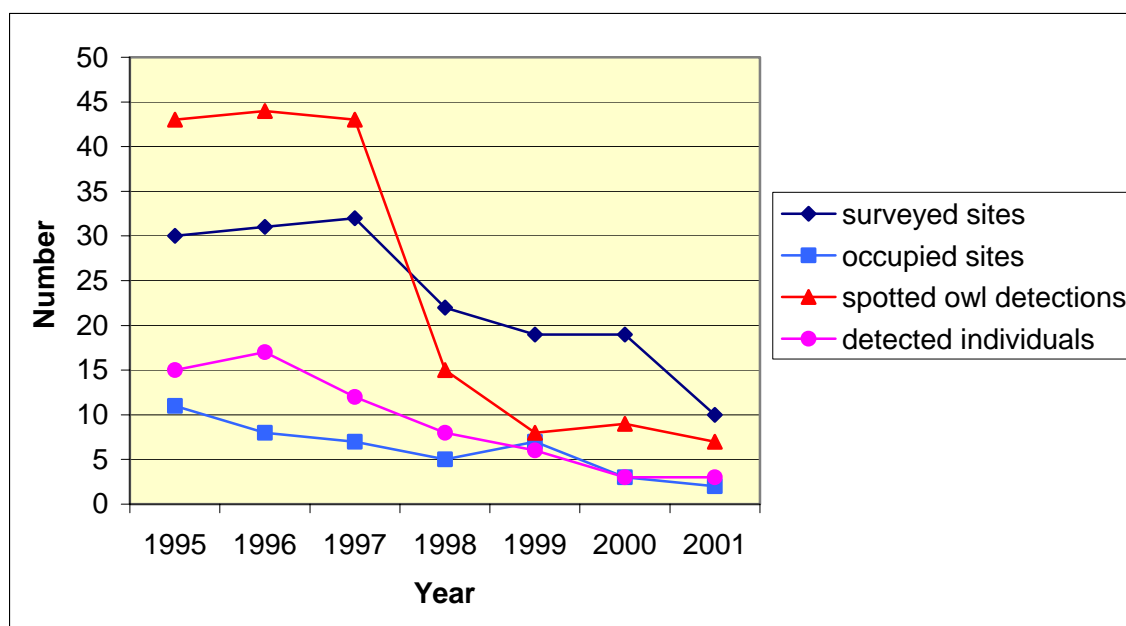
DNR monitoring program in OESF was developed in 1995 to provide baseline data about the abundance, distribution, survival, reproduction and movements of owls in the OESF area. The monitoring results will help to evaluate the success of DNR management techniques in integrating conservation with production. In addition to that, DNR monitoring in the OESF compliments the ongoing Forest Service PNW effectiveness monitoring in Olympic Peninsula demography study area as part of the Northwest Forest Plan monitoring.

Spotted owl monitoring in OESF follows the standardized federal protocol for gathering data on occupancy and reproduction. The initial number of surveyed areas was 25. Three of the areas were located on the territory of the Olympic National Park. Four of the areas had multiple spotted owl sites. The number of surveyed sites (and areas) varied through the years, based on prioritization system developed by the survey team (highest priority sites were either occupied by banded owls or important to the conservation strategy but without history of thorough surveys). The highest number of sites (32) was surveyed in 1996. The number of surveyed sites in years 2001, 2002, and 2003 dropped significantly because of the staff shortage and because most of the sites were found not occupied by spotted owls for several consecutive years.

**Table 6.1: DNR data on Northern Spotted Owl monitoring in Olympic Experimental State Forest**

Year	Spotted Owl Sites		Spotted Owl detections				Barred owl detections
	Surveyed	Occupied	Total	Individuals	Pairs	Singles	
1995	30	11	43	15	3	8	5
1996	31	8	44	17	4	4	7
1997	32	7	43	12	3	2	5
1998	22	5	15	8	3	2	8
1999	19	7	8	6	0	6	7
2000	19	3	9	3	1	2	2*
2001	10	2	7	3	1	1	6

\* The small number is due in large part to not surveying the Queets Corridor, where numerous barred owls had been detected in previous years

**Figure 6.3: Dynamics of the spotted owl occupancy and abundance in OESF for the period 1995-2001**

### Eastside Planning Units

In 2001 DNR contracted the National Council for Air and Stream Improvement (NCASI) to monitor northern spotted owl occupancy in the three Eastside Planning Units. NCASI has been conducting monitoring of spotted owls in eastern slopes of Cascades for more than 16 years with about 34 sites (located on federal, state, and private ownerships) monitored annually. Eighteen of these sites are on DNR-managed land (the number slightly varies through the years because the owls are found in slightly different areas each year, sometimes across an ownership line).

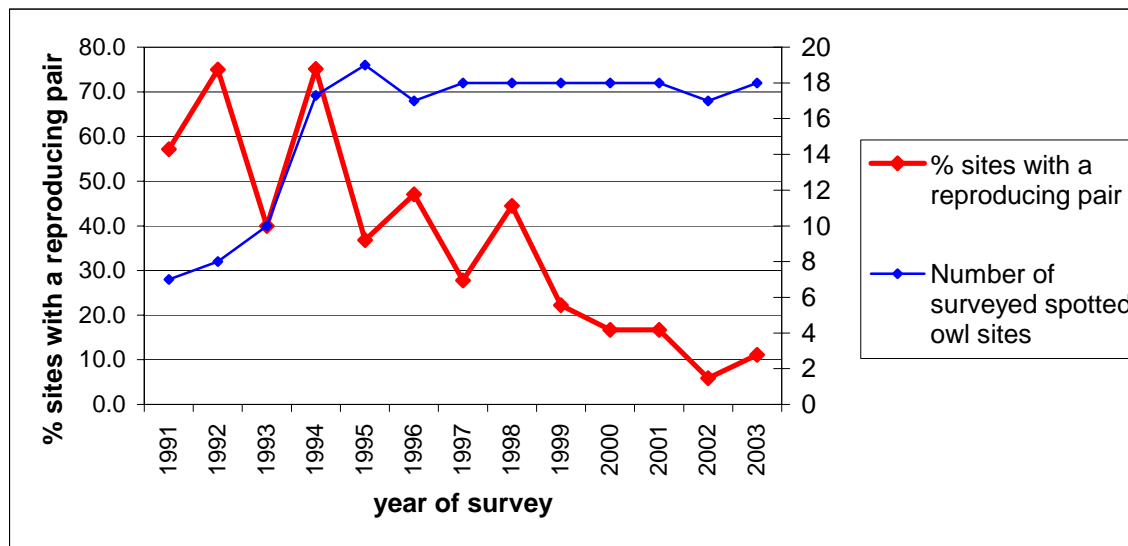
NCASI does not follow the standardized federal owl survey monitoring protocol. They follow their own protocol.

**Table 6.2: Occupancy of the spotted owl sites in the Eastside planning units**

Year	Surveyed spotted owl sites	Spotted owl detections			No detection
		Reproductive pair or nest	Non-reproductive pair	Single male or female	
1991	7	4	2	1	0
1992	8	6	2	0	0
1993	10	4	3	1	2
1994	18	13	2	1	2
1995	19	7	3	5	5
1996	17	8	3	3	3
1997	18	5	2	1	10

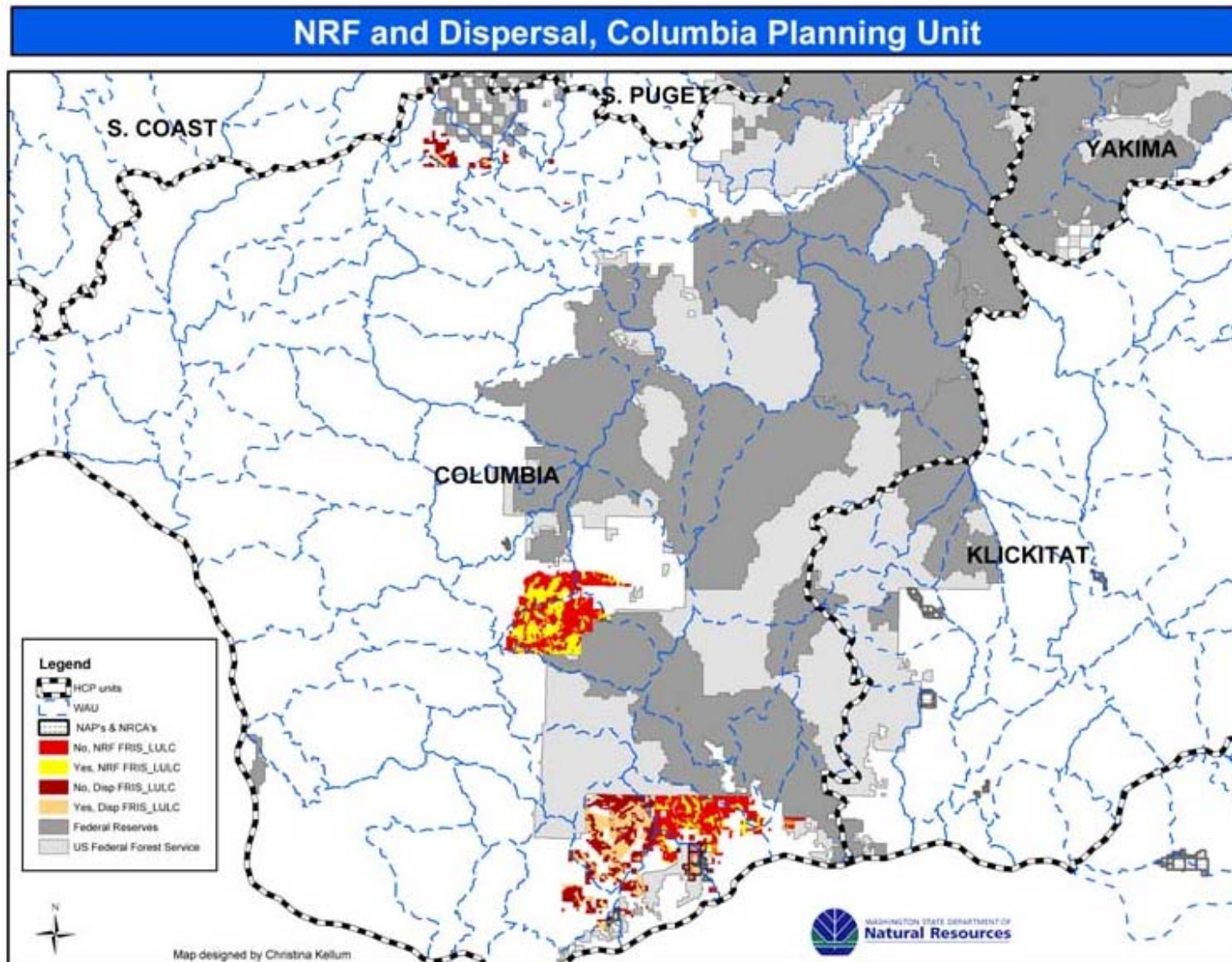
Year	Surveyed spotted owl sites	Spotted owl detections			No detection
		Reproductive pair or nest	Non-reproductive pair	Single male or female	
1998	18	8	1	2	7
1999	18	4	4	4	6
2000	18	3	7	3	7
2001	18	3	4	1	10
2002	17	1	3	3	10
2003	18	2	0	4	12

**Figure 6.4: Percentage of surveyed northern spotted owl sites occupied by reproducing pairs in Eastside planning units**

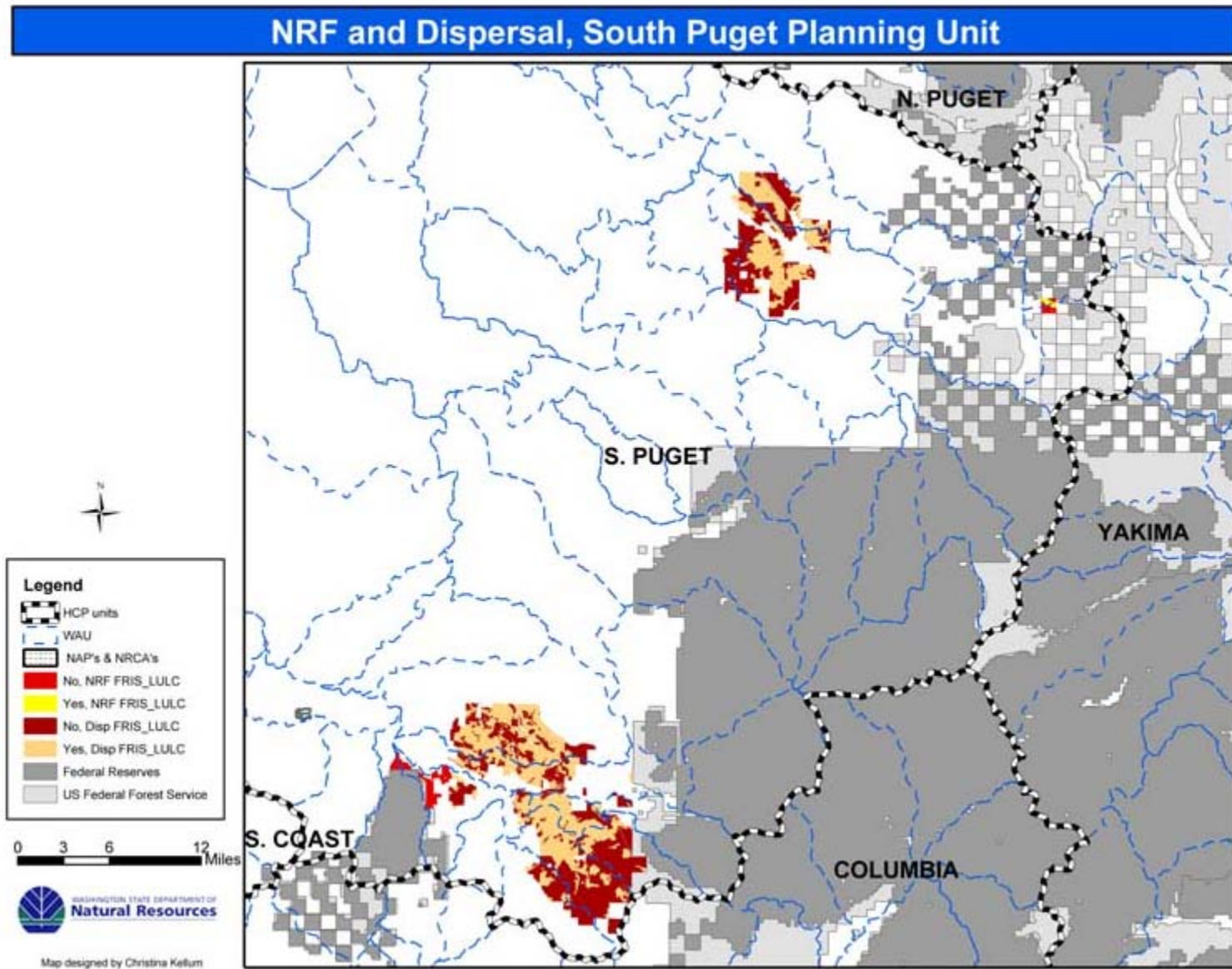


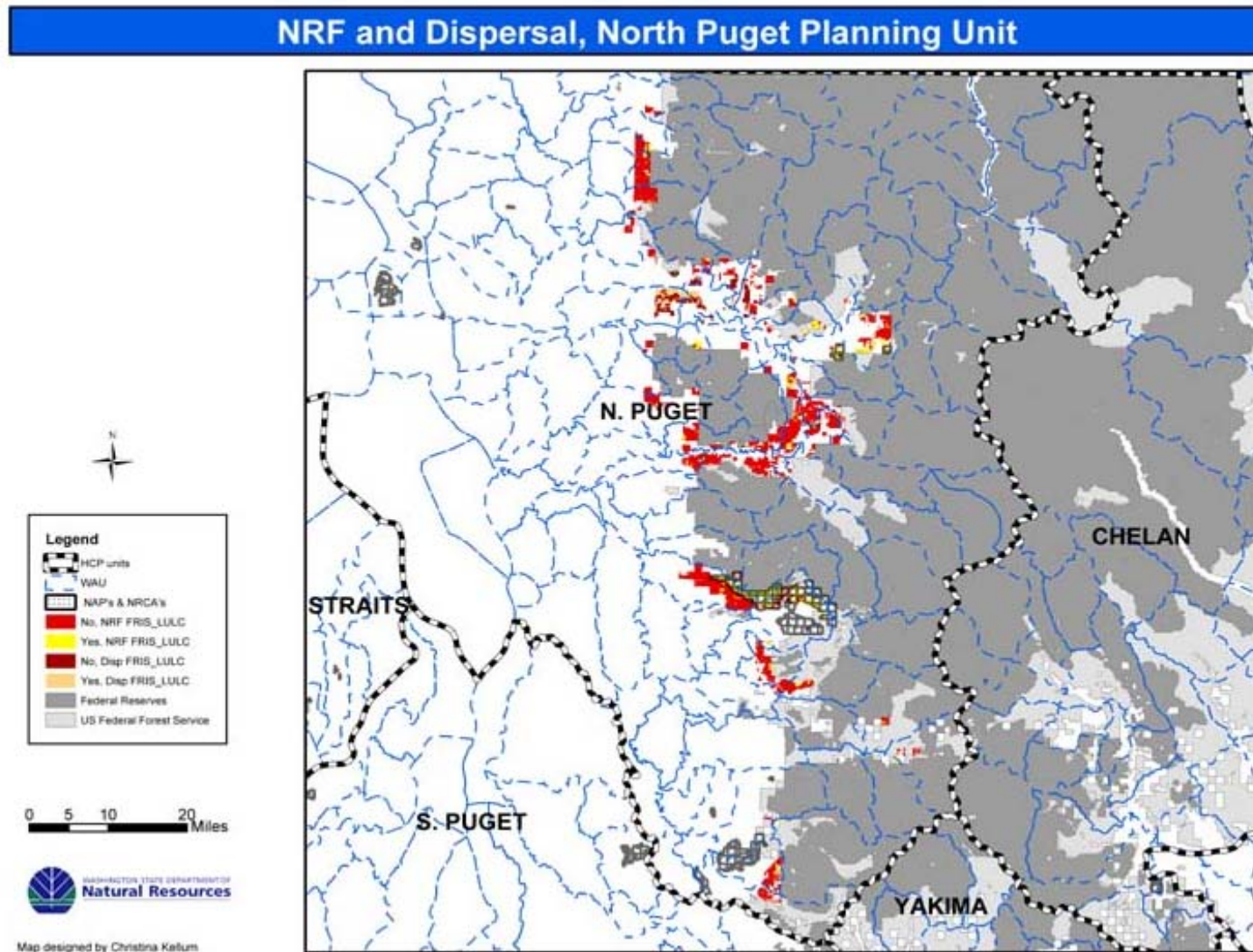
**Describe the amendment proposal for addressing forest health/spotted owls in Klickitat County.**

- Administrative amendment started in 2002 in collaboration with the Services and WA Department of Fish and Wildlife
- Amendment has gone through all review processes, including SEPA
- Anticipated timeline:
  - April 2004: final edits
  - May 2004: letter of approval from USFWS
  - June 2004: implementation









**Table 6.3: Amounts of designated and actual NRF and Dispersal owl habitat per WAU**

HCPUNIT	WAU97_ID	WAU97_NAME	Designated NRF ACRES	Acres NRF (FRIS)	% NRF (FRIS)	Acres NRF (FRIS & LULC)	% NRF (FRIS & LULC)	Designated Disp. Acres	Acres Disp. (FRIS)	% Dispersal (FRIS)	Acres Dispersal (FRIS & LULC)	% Dispersal (FRIS & LULC)
COLUMBIA	270406	CANYON CREEK	559.1	281	50.3	281	50.3	0	0	0	0	0
COLUMBIA	270305	SIOUXON	15002.1	6732.9	44.9	6799.4	45.3	0	0	0	0	0
COLUMBIA	270317	COUGAR	8865.3	3531.6	39.8	3531.6	39.8	0	0	0	0	0
COLUMBIA	290415	ROCK CREEK	15647.7	3491.8	22.3	4065.8	26	572.6	179.7	31.4	179.7	31.4
COLUMBIA	280106	HAMILTON CREEK	4139.9	537.9	13	1063.6	25.7	2628.5	92.2	3.5	952.9	36.3
COLUMBIA	290413	LITTLE WIND	642.8	0	0	129.1	20.1	0	0	0	0	0
COLUMBIA	270304	SWIFT CREEK	4793.9	930.9	19.4	945.8	19.7	0	0	0	0	0
COLUMBIA	290414	WIND RIVER	2896	397.3	13.7	397.7	13.7	0	0	0	0	0
COLUMBIA	270415	LAKE MERWIN	565.1	65.5	11.6	65.5	11.6	0	0	0	0	0
COLUMBIA	260304	HUFFAKER	0	0	0	0	0	272.8	272.8	100	272.8	100
COLUMBIA	260317	KOSMOS	0	0	0	0	0	17	0	0	17	100
COLUMBIA	280107	MT ZION	0	0	0	0	0	672.5	0	0	519	77.2
COLUMBIA	280205	UPPER WASHOUGAL	43.3	0	0	0	0	19657.1	9340	47.5	9357.9	47.6
COLUMBIA	260330	HARMONY	0	0	0	0	0	1171	432.1	36.9	432.1	36.9
COLUMBIA	280204	SILVERSTAR	0	0	0	0	0	3865.7	932.3	24.1	1043.1	27
COLUMBIA	260318	MORTON	0	0	0	0	0	436	68.4	15.7	68.4	15.7
COLUMBIA	260331	BREMER	0	0	0	0	0	2578.9	351.2	13.6	351.2	13.6
COLUMBIA	260336	EF TILTON	0	0	0	0	0	153.5	7.3	4.7	7.3	4.7
COLUMBIA	260333	CONNELLY	0	0	0	0	0	1.1	0	0	0	0
COLUMBIA	260319	RIFFE	0	0	0	0	0	0.1	0	0	0	0
COLUMBIA	260334	WF TILTON	0	0	0	0	0	3.5	0	0	0	0
N. PUGET	70104	FOSS RIVER	144.8	0	0	144.8	100	0	0	0	0	0
N. PUGET	50106	SILVERTON	2050	0	0	2050	100	0	0	0	0	0
N. PUGET	40533	PRESSENTIN	655.8	516.3	78.7	516.3	78.7	0	0	0	0	0

HCPUNIT	WAU97_ID	WAU97_NAME	Designated NRF ACRES	Acres NRF Habitat (FRIS)	% NRF (FRIS)	Acres NRF (FRIS & LULC)	% NRF (FRIS & LULC)	Designated Disp. Acres	Acres Disp. (FRIS)	% Dispersal (FRIS)	Acres Dispersal (FRIS & LULC)	% Dispersal (FRIS & LULC)
N. PUGET	40523	ILLABOT	1476.6	0	0	1131.2	76.6	168.1	120	71.4	120	71.4
N. PUGET	70216	SPADA	7289.3	0	0	4668.2	64	0	0	0	0	0
N. PUGET	70225	OLNEY CREEK	398.2	0	0	223.2	56	0	0	0	0	0
N. PUGET	40531	CORKINDALE	1314.9	0	0	707.9	53.8	0	0	0	0	0
N. PUGET	50107	VERLOT	862.9	0	0	345.9	40.1	0	0	0	0	0
N. PUGET	70305	UPPER MIDDLE	225.6	75	33.2	86.5	38.4	0	0	0	0	0
N. PUGET	40224	JORDAN- BOULDER	6446.2	138.1	2.1	1761.1	27.3	126.5	102.2	80.8	102.2	80.8
N. PUGET	10307	WANLICK CREEK	864.3	82.4	9.5	182.6	21.1	0	0	0	0	0
N. PUGET	70226	PILCHUCK MTN	13946.5	402.4	2.9	2714.2	19.5	0	0	0	0	0
N. PUGET	70115	NORTH FORK SKYKOMISH	1844.6	0	0	321.5	17.4	0	0	0	0	0
N. PUGET	10229	WARNICK	2679	447.2	16.7	447.2	16.7	0	0	0	0	0
N. PUGET	40529	JACKMAN	902.4	0	0	139.8	15.5	122.8	0	0	0	0
N. PUGET	70102	BECKLER RIVER	688.1	0	0	99.9	14.5	0	0	0	0	0
N. PUGET	40321	RINKER	8250.6	1034.7	12.5	1034.7	12.5	570.5	218.6	38.3	222	38.9
N. PUGET	70103	DECEPTION	620.4	0	0	66.7	10.8	0	0	0	0	0
N. PUGET	10308	HOWARD CREEK	1756.1	31	1.8	170.5	9.7	394	14.4	3.6	14.4	3.6
N. PUGET	50201	DEER CREEK	2146.1	208.1	9.7	208.1	9.7	0	0	0	0	0
N. PUGET	70307	LOWER MIDDLE	3287.1	6.4	0.2	301.8	9.2	0	0	0	0	0
N. PUGET	50203	HAZEL	4318.7	345.1	8	345.1	8	0	0	0	0	0
N. PUGET	70306	SOUTH SNOQUALMIE	1805.7	86	4.8	139.8	7.7	0	0	0	0	0
N. PUGET	70217	WALLACE RIVER	5890.6	69.3	1.2	424.2	7.2	0	0	0	0	0
N. PUGET	10328	CLEARWATER CREEK	5046.2	188	3.7	302.9	6	0	0	0	0	0

HCPUNIT	WAU97_ID	WAU97_NAME	Designated NRF ACRES	Acres NRF Habitat (FRIS)	% NRF (FRIS)	Acres NRF (FRIS & LULC)	% NRF (FRIS & LULC)	Designated Disp. Acres	Acres Disp. (FRIS)	% Dispersal (FRIS)	Acres Dispersal (FRIS & LULC)	% Dispersal (FRIS & LULC)
N. PUGET	50214	EBEY HILL	2133.1	94.6	4.4	96.6	4.5	0	0	0	0	0
N. PUGET	10232	CANYON CREEK	865.4	30.5	3.5	30.5	3.5	0	0	0	0	0
N. PUGET	50204	FRENCH BOULDER	6866.8	208.4	3	240	3.5	0	0	0	0	0
N. PUGET	40319	TENAS	4516.6	132.6	2.9	133.9	3	341.6	169.4	49.6	169.4	49.6
N. PUGET	10306	MARMOT RIDGE	4136	91.1	2.2	121.2	2.9	0	0	0	0	0
N. PUGET	50202	UPPER NF STILLY	3370.3	67.1	2	67.1	2	0	0	0	0	0
N. PUGET	40320	SAUK PRAIRIE	4021.6	67.4	1.7	67.4	1.7	514.1	207.7	40.4	207.7	40.4
N. PUGET	40316	CLEAR CREEK	1081.8	9.1	0.8	9.1	0.8	1.1	0.9	82.7	0.9	82.7
N. PUGET	40435	W SHANNON	1228.4	10.3	0.8	10.3	0.8	1363.7	305.5	22.4	305.5	22.4
N. PUGET	40317	DAN CREEK	245.1	1.3	0.5	1.3	0.5	0	0	0	0	0
N. PUGET	40530	MILLER CREEK	35	0	0	0	0	40.7	0	0	35.5	87.4
N. PUGET	40322	HILT	379.1	0	0	0	0	651.4	526.9	80.9	526.9	80.9
N. PUGET	30103	ALDER	0	0	0	0	0	6711	3418.2	50.9	3418.2	50.9
N. PUGET	40534	GRANDY	411.2	0	0	0	0	2595.2	1168.8	45	1168.8	45
N. PUGET	40532	FINNEY	590.8	0	0	0	0	346.8	139.9	40.3	139.9	40.3
N. PUGET	40436	E SHANNON	1900.8	0	0	0	0	1438.9	244.5	17	253.9	17.6
N. PUGET	50316	CAVANAUGH	921.3	0	0	0	0	0	0	0	0	0
N. PUGET	30105	DAY CREEK	610.7	0	0	0	0	0	0	0	0	0
N. PUGET	40128	DIOBSUD CREEK	117.8	0	0	0	0	0	0	0	0	0
N. PUGET	70218	HAYSTACK	146.7	0	0	0	0	0	0	0	0	0
N. PUGET	40318	LIME CREEK	368.7	0	0	0	0	0	0	0	0	0
N. PUGET	30104	LORETTA	748.9	0	0	0	0	0	0	0	0	0
N. PUGET	40437	MT BAKER	0.4	0	0	0	0	0	0	0	0	0
N. PUGET	70313	NORTH FORK SNOQUALMIE	267.2	0	0	0	0	0	0	0	0	0

HCPUNIT	WAU97_ID	WAU97_NAME	Designated NRF ACRES	Acres NRF Habitat (FRIS)	% NRF (FRIS)	Acres NRF (FRIS & LULC)	% NRF (FRIS & LULC)	Designated Disp. Acres	Acres Disp. (FRIS)	% Dispersal (FRIS)	Acres Dispersal (FRIS & LULC)	% Dispersal (FRIS & LULC)
N. PUGET	10327	PORTER CANYON	26.2	0	0	0	0	0	0	0	0	0
N. PUGET	10309	SKOOKUM CREEK	1020.2	0	0	0	0	0	0	0	0	0
N. PUGET	70224	SULTAN RIVER	99.3	0	0	0	0	0	0	0	0	0
S. PUGET	90107	SUNDAY	57.6	22.9	39.7	22.9	39.7	0	0	0	0	0
S. PUGET	90108	GREEN	579.8	209.8	36.2	209.8	36.2	0	0	0	0	0
S. PUGET	110113	EAST CREEK	1721.1	25.2	1.5	25.2	1.5	1439	411	28.6	411	28.6
S. PUGET	80106	LANDSBURG	0	0	0	0	0	6.7	5.6	83	5.6	83
S. PUGET	110106	REESE CREEK	0	0	0	0	0	4494	3482.9	77.5	3482.9	77.5
S. PUGET	110204	BUSY WILD	0	0	0	0	0	14999.5	9735.5	64.9	9735.5	64.9
S. PUGET	110104	ASHFORD	1.8	0	0	0	0	6600.6	4137.2	62.7	4137.2	62.7
S. PUGET	90104	NORTH FORK GREEN	0	0	0	0	0	6487.3	3535.6	54.5	3535.6	54.5
S. PUGET	90103	HOWARD HANSEN	0	0	0	0	0	13897.8	6882.5	49.5	6882.5	49.5
S. PUGET	110112	NF MINERAL	0	0	0	0	0	13341	6095.3	45.7	6095.3	45.7
S. PUGET	110107	BIG	0	0	0	0	0	568.9	182	32	182	32
S. PUGET	110108	CATT	0	0	0	0	0	6938.2	2123.9	30.6	2123.9	30.6
S. PUGET	110110	MINERAL CREEK	0	0	0	0	0	4659.6	1397.5	30	1397.5	30
S. PUGET	90202	CUMBERLAND	0	0	0	0	0	1546.9	90.7	5.9	100.9	6.5
S. PUGET	110114	LITTLE NISQUALLY	267.1	0	0	0	0	0	0	0	0	0
S. PUGET	100203	MUD MOUNTAIN	0	0	0	0	0	386.4	0	0	0	0



## **Chapter 7: Marbled Murrelets**

### **Interim HCP Conservation Strategy for Marbled Murrelets**

**Peter Harrison, WA DNR**

In planning and preparing the Department of Natural Resources Habitat Conservation Plan (1994 to 1996), DNR acknowledged the incomplete state of our knowledge in proposing an interim conservation strategy for Marbled Murrelets. The HCP (DNR 1997, pp. IV.39-40) explicitly described a stepwise, interim conservation strategy that serves to focus knowledge and conservation measures. The strategy is currently being implemented in the following manner: 1) Defer harvest of timber stands that meet interim structural definitions of habitat; 2) Develop statistical models for each of six large watershed-based planning units that predict the probabilities that DNR-managed forest stands will be used (i.e., “occupied”, Evans Mack et al. 2003) by murrelets; 3) Conduct a complete inventory of murrelet use of the stands predicted to contain 95% of the use on DNR-managed land in the planning unit. Defer from harvest those stands within 0.5 miles of occupied sites; 4) Simultaneous with initiating the inventory, release the marginal habitat predicted to contain only 5% of the murrelet use for harvest; and 5) Using information developed in the studies summarized above, and other available information, develop and implement a long-term strategy for murrelet conservation for each planning unit. The long term strategy was intended to help meet objectives of the Recovery Plan (USFWS 1997), and to “...make a significant contribution to maintaining and protecting marbled murrelet populations in western Washington...” (DNR 1997, p. IV.44).

#### **A Long-term Conservation Strategy for Four Planning Units**

Nine planning units comprise the area managed under the HCP; marbled murrelets inhabit all 6 west-side planning units. The South Puget Planning Unit has yet to receive a predictive model, and for that reason continues to defer timber harvest in stands that meet interim structural definitions of habitat (step 1 described above). Information-gathering and marginal habitat release (steps 2-4 described above) are in progress in the North Puget Planning Unit, but has been substantially completed on the Olympic Peninsula (Straits and OESF) and southwest Washington (South Coast and Columbia) planning units. As agreed upon in the HCP (DNR 1997, p. IV.40), DNR and USFWS are initiating the process of developing the long-term murrelet conservation strategy for these 4 planning units, which encompass part of Conservation Zone 1 and all of Zone 2 designated in the Recovery Plan (USFWS 1997).

In the fall of 2003 a planning team was created to assist with the long-term conservation strategy with representatives from DNR, US Fish and Wildlife Service and the Washington State Department of Fish and Wildlife. The planning team immediately identified the need to convene a scientific summit with the primary goal to generate input from murrelet experts that will be incorporated into the long-term conservation strategy and to recruit willing participants to assist the DNR in the development of this strategy.

The summit took place at the end of October 2003 and provided DNR with valuable comment and debate on issues surrounding long-term conservation planning. In December of 2003 a Scientific Advisory Group was created that will be responsible for drafting the long-term conservation strategy. Recruitment of Marty Raphael of the USFS Pacific Northwest Research Station, Kim Nelson, Research Biologist at Oregon State University and Paul Phifer of the USFWS, Portland Office to the scientific advisory group will provide additional scientific support and guidance in the long-term planning process.

The Scientific Advisory Group is currently developing the conservation strategy. A draft plan is scheduled to be delivered by June of 2004 with the final plan completed in the summer or early fall of 2004. Pertinent questions the team will address are:

1. How large and contiguous should habitat areas be to sufficiently conserve murrelet-breeding areas?
2. In what developmental stages, and how much forest buffer is necessary?
3. How should new murrelet habitat be positioned and configured?
4. How should fragmentation be defined relevant to murrelet conservation?
5. How can the importance of individual murrelet sites be ranked?

DNR suggests that answers to these questions will be central to developing a strategy that is effective for murrelet conservation, consistent with its HCP agreement, and is efficient for DNR to implement and integrate with its other land management responsibilities. Effective murrelet conservation will require a significant commitment of trust lands, and DNR believes it is worth a substantial effort to have a scientifically based management plan, with measurable objectives, an empirical basis for predicting outcomes, and a credible approach to improve the strategy if necessary.

### **Summary of HCP-directed Murrelet Surveys in the OESF Planning Unit, 1996-2001**

DNR delineated 600 survey sites comprising 39,286 acres. The survey project was quite expensive (\$1.3 million in contract costs) and thus took longer to complete than anticipated, with the final year of surveys in 2001. Effort was distributed over the project as reported in Table 7.1 for surveys initiated in each of 5 years.

**Table 7.1: Survey effort in the OESF Planning Unit**

Start Year	1996	1997	1998	1999	2000
Sites (N)	235	192	63	31	79
Acres	13,826	13,304	4,142	2,151	5,864

Survey sites without murrelet detections comprised 3,017 acres, sites with presence totaled 14,686 acres, while most of the area surveyed (21,583 acres) was within occupied sites.



### Summary of HCP-directed Murrelet Surveys in the South Coast and Columbia Planning Units, 1998-2002

DNR delineated 450 survey sites comprising 23,861 acres. Effort was distributed over the project as reported in Table 7.2 for surveys initiated in each of 4 years.

**Table 7.2: Survey effort in the South Coast and Columbia Planning Units**

Start Year	1998	1999	2000	2001
Sites (N)	166	55	98	131
Acres	8,159	3,245	5,239	7,218

Survey sites with occupied detections comprised 5,406 acres, sites with presence totaled 1,871 acres, while most of the area surveyed (16,583 acres) was without murrelet detections.

### Summary of HCP-directed Murrelet Surveys in the Straits Planning Unit, 2000-2003

DNR delineated 289 survey sites comprising 14,811 acres. Effort was distributed over the project as reported in Table 7.3 for surveys initiated in each of 3 years.

**Table 7.3: Survey effort in the Straits Planning Unit**

Start Year	2000	2001	2002
Sites (N)	112	157	20
Acres	6,597	7,543	671

Survey sites with occupied detections comprised 3,429 acres, sites with presence totaled 5,871 acres, and sites with no detections totaled 5,510 acres.

### Summary of HCP-directed Murrelet Surveys in the North Puget Planning Unit, 2001-2004

There have been concerns regarding the validity of the research and modeling effort in identifying areas in the North Puget Planning Unit (NPPU) expected to contain 95% of the occupied marbled murrelet sites. The research results were not expected, given what has been observed in terms of marbled murrelet occupancy and stand structure in other parts of the state and elsewhere. Based on this modeling effort, the acreage of *reclassified* habitat constitutes approximately 28,000 acres in the NPPU. Consequently, the USFWS and DNR agreed to look at the forest characteristics of other previously identified occupied sites in the NPPU. Based on that review, two additional screens were used for the modeling effort and the thresholds using these screens resulted in approximately 6,000 additional acres termed as *reclassified plus* habitat (Clay Sprague memo dated November 18, 2002). DNR agreed to defer harvest on these acres and add them to the survey effort, with the understanding that as these acres are examined on the

ground, those that do not contain suitable marbled murrelet habitat will be released and not surveyed.

As a result of these processes, a total of 34,000 acres could be required to be inventory surveyed in NPPU before a long-term conservation strategy is undertaken. A substantial proportion of these survey acres are located above 3,000 feet in elevation. The extreme conditions of these sites (access, terrain, snow pack, and weather) would most likely make completing surveys to full protocol very difficult and even quite dangerous. It has been estimated that, given the challenge and the time it takes to complete these difficult surveys, it would take over a decade (costing upwards of \$1.5 million) to complete these inventory surveys in NPPU. Based on this information, it was unanimously decided by DNR, USFWS, and WDFW staff to address alternate methods to successfully implement the HCP's interim marbled murrelet conservation strategy.

Identified below are the agreed upon alternate methods for the selection of stands that will receive inventory surveys.

1. Conduct 2-year protocol surveys only to areas inside *reclassified* and *reclassified plus* FRIS polygons that are suitable marbled murrelet habitat (suitable habitat is defined in the HCP on pages IV. 40-42).
2. Do not survey in areas inside *reclassified* polygons that do not contain marbled murrelet habitat as defined in the HCP.
3. If no suitable habitat is present inside a *reclassified plus* polygon, this area will be released from its deferral status and no surveys will be conducted.
4. If no suitable habitat is present inside a *reclassified* polygon, this *reclassified* habitat polygon may be released from its deferral status after approval from State Lands Assistant Division Manager and HCP Implementation Manager, in collaboration with USFWS and WDFW.
5. Identify and conduct 2-year protocol surveys to areas outside of *reclassified* and *reclassified plus* polygons but are considered suitable marbled murrelet habitat as defined in the HCP.

The marbled murrelet research and modeling effort is to be used as an initial screening tool to identify areas that may potentially contain suitable marbled murrelet habitat. However, an on-the-ground assessment will be necessary to determine the presence or absence of this suitable habitat as defined in the HCP.

Effort was distributed over the project as reported in Table 7.4 for surveys initiated in each of 4 years.

**Table 7.4: Survey effort in the North Puget Planning Unit**

Start Year	2001 ( <i>Reclassified</i> Habitat)	2002 ( <i>Plus</i> Habitat)	2003	2004 ( <i>Plus</i> Habitat & <i>Suitable</i> Habitat outside modeled)
Sites (N)	113	12	0	63(estimated)
Acres	5,000	300	0	2,100(estimated)

### **South Puget Planning Unit**

The modeling effort has not yet begun in the South Puget Planning Unit (SPPU). DNR expects to use similar methods as in the NPPU to identify stands for the inventory surveys. Work will begin in the spring of 2004 with preliminary stand assessments conducted under the direction of the region biologist. Initiation of surveys could be expected in 2005 or 2006 depending on budget allotments.

#### **References**

DNR (Washington State Department of Natural Resources). 1997. Final Habitat Conservation Plan. DNR. Olympia, WA.

Evans Mack, D.M., W.P. Ritchie, S.K. Nelson, E. Kuo-Harrison, P. Harrison, and T.E. Hamer. 2003. Methods for Surveying Marbled Murrelets in Forests: An Update to the Protocol for Land Management and Research. Pacific Seabird Group, Marbled Murrelet Tech. Committee.

USFWS (U.S. Fish and Wildlife Service). 1997. Recovery Plan for the Threatened Marbled Murrelet (*Brachyramphus marmoratus*) in Washington, Oregon and California. Portland, OR.

## **Chapter 8: Other Species**

### **Grizzly Bear Update**

- DNR participating in both the Technical Committee and Oversight Committee
- Anticipated timeline:
  - Jan 2005: DNR begins re-work on plan
  - June 2005: draft plan complete
  - July 2005: scientific review
  - Aug/Sept 2005: SEPA/NEPA review
  - Oct 2005: biological opinion complete and apply for Incidental Take Permit (ITP)
  - Jan 2006: plan implementation

### **Canada Lynx Update**

- 1996: original plan created; 5-year update due in 2001
- 2000: became a federally listed species, incorporating 7 additional federal conditions
- Anticipated timeline:
  - April 2004: complete draft plan
  - May 2004: scientific review
  - June 2004: SEPA draft
  - Aug 2004: finalized plan
  - Sept 2004: Forest Practices Board (FPB)/Board of Natural Resources (BNR)
  - Oct 2004: plan implementation

## Chapter 9: Monitoring and Research

### Richard Bigley, WA DNR

The DNR HCP research program supports the continued development and improved implementation of the HCP conservation strategies. Research is carried out to answer information needs, which the HCP framed as specific questions. These questions can be grouped under three broad research objectives:

- *To obtain information needed to move from short- to long-term conservation strategies.*
- *To obtain information needed to assess and improve the effectiveness of the conservation strategies.*
- *To obtain information needed to increase management options and commodity production opportunities for lands managed pursuant to the HCP.*

These objectives give rise to three research priorities:

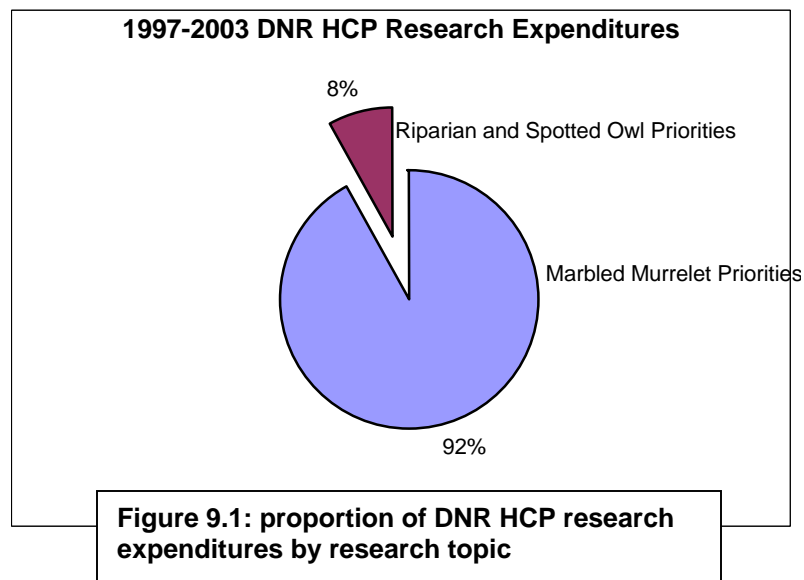
*(1) Research that is a necessary part of a conservation strategy. DNR recognizes the interim nature of a short-term approach and has delayed management actions until new information is obtained.*

*(2a) Research needed to assess or improve conservation strategies that are in place. Information gaps that restrict DNR's ability to provide conservation benefits are evident, but DNR has not delayed management actions.*

*(2b) Research needed to increase management options and commodity production opportunities for lands managed pursuant to the HCP, including testing of new technologies and experimental application of silvicultural techniques.*

*(3) Research needed to improve general understanding of the animals, habitats, and ecosystems addressed by the HCP.*

The following list of research topics and priorities were identified in the HCP (DNR 1997 pp. V. 6-8). Since the signing of the HCP the majority of available research funding has gone to supporting the completion of the long-term marbled murrelet conservation strategy (Fig. 9.1). The majority of the marbled murrelet research funding has gone to inland (stand level) surveys of murrelet activity and the analysis of habitat relationships.



The following briefly summarizes the efforts DNR has sponsored to address specific HCP research questions. The question in italics is from the HCP and bolded statements underneath cite the research effort that in part help address the question. In general, progress is in 3 categories; *No strategic planning and/or pilot sampling research at this time* meaning no strategic thinking or research planning has been undertaken, *Strategic planning and/or pilot sampling research* meaning strategic planning has been initiated and may include pilot sampling and analysis, and *Ongoing research* meaning strategic planning conducted and project is implemented.

### ***Research Priorities and Topics***

#### ***Priority 1 Riparian***

- *Determine how to design and manage riparian buffers that maintain wind-firm streamside forests.- Ongoing research*

- **Windthrow in Riparian Areas –**

It is anticipated that this windthrow research will help in the design of wind buffers as part of the HCP stream buffering strategy and the future experimental tests of wind buffers. Current plans are to use existing aerial photographs to quantify the historic windthrow extent in unmanaged RMZs. We are using a chronosquence approach to measure extent of wind impacts on canopies in RMZ's from the early 1990's. Wind throw will also be monitored on all the riparian silviculture effectiveness monitoring sites. *Project Status:* Initiated in 1997, now at 30 locations in western Washington, currently pending post-treatment measurements and access to stereo analysis. *Principal Investigator:* Dr Richard Bigley, WA DNR

- *Evaluate the local and downstream effects of forest management activities along Type 5 waters not associated with unstable slopes. Determine whether conditions necessitate buffers along Type 5 streams, and if so, determine how to design and manage such buffers. - Ongoing research*

- **Small Stream Buffer Experimentation -**

The DNR, in cooperation with the USFS Pacific Northwest Forestry Sciences Laboratory, initiated a project to determine the possible impacts and consequences of different management approaches on first order streams in western Washington. The study design will impose a range of management configurations on adjacent headwater streams. The results of this study will help support the development of a long-term conservation strategy for Type 5 streams on state lands in western Washington. *Project Status:* Initiated in 1999, now at 9 locations in DNR Pacific Cascade Region (former Central Region); currently starting post treatment measurements. *Principal Investigators:* Dr Richard Bigley, WA DNR; Drs. Martin Raphael and Peter Bisson, PNW Forestry Sciences Laboratory; Drs. Bob Edmonds, Dan Vogt, and Susan Bolton, University of Washington; Dr. Bill Ehinger; WA Department of Ecology.

- **Type 5 Stream Literature Review -**

DNR has conducted a literature review, illustrating the gaps and needed areas of research. This review can be found online at <http://www2.wadnr.gov/type5/>.

*Project Status:* The literature review is periodically updated. *Principal Contact:* Dr. Richard Bigley, WA DNR.

- **Maintaining Hydrologic Functions in Forested Wetlands -**

Small streams and wetlands are believed to have a critical role in maintaining summer stream flow and damping the effects of autumn storms on sediment transport to fish habitats. However, the downstream effect of land management on small stream and wetland hydrology is poorly understood in the Pacific Northwest. This project will quantify the effects of timber harvest on forested wetland water table levels as part of a more comprehensive validation of the HCP wetland conservation strategy. *Project Status:* Initiated in 1999, in the OESF; post treatment measurements are currently being collected. *Principal Investigators:* Dan Berlin, Duke University and Dr. Richard Bigley, WA DNR.

***Priority 1 Spotted Owl***

- *Determine the amounts of down woody debris necessary for nesting, roosting/foraging, and dispersal habitats. - Ongoing research*

- **Functional Role of Down Woody Debris and Long-term Site Productivity -**

The project tests the functional role of down woody debris as habitat. Revision of the down wood targets for DNR HCP units is one of our adaptive management goals. The results of this project also support OESF research into long-term site productivity and balancing ecological and commodity production. The research project is funded by the US Forest Service. The OESF site is one of five replicates in the Pacific Northwest. *Project Status:* Initiated in 1997, in the OESF; post treatment measurements are currently being collected. Reports are available online at <http://www.fsl.orst.edu/ltep/>. *Principal Investigators:* Drs. Robyn Darbyshire and Bernard Bormann, US Forest Service. Cooperators include The University of Washington, Oregon State University, The University of Oregon, and Western Washington University.

- *Develop better stand-level definitions for nesting habitat. – Strategic planning and/or pilot sampling research*

- **Canopy Cover Relationships in Spotted Owl Habitat -**

Several improvements are required in stand-level definitions for spotted owl habitats. This project developed a research plan to test methodologies to improve the application of habitat definitions. Field measurements and modeling will be used to improve our understanding of canopy cover and stand characteristics. *Project Status:* Concluded. A study plan is available from DNR. *Principal Investigators:* Drs. Paula Swedeen, Catherine Rose, and Richard Bigley, WA DNR.

- **Canopy Cover in Relation to Relative Density -**  
Analysis was conducted to refine the relationship between Curtis relative density and canopy cover in spotted owl habitat in eastern Washington. *Project Status:* Concluded. A draft report is available from DNR. *Principal Investigator:* Dr. Bill Barber, WA DNR.
- **Structure and Composition of Spotted Owl Nesting, Roosting, and Foraging Habitat in the Klickitat District. -**  
Habitat definitions in the HCP are largely based on studies conducted at spotted owl nest sites in the east central Cascades. These definitions may not describe owl habitat in Klickitat County and, in fact, may not be sufficient for general definitions of roosting and foraging habitat across DNR-managed land in the east-side HCP Planning Units. This analysis considered possible means to update habitat definitions (at least for the Klickitat District) by producing FRIS-based summaries of the characteristics of structurally complex, later-successional stands near historic, reproductively successful spotted owl sites. The analysis explored a simple index of habitat that could be used as an indicator of stands likely to contain characteristics of owl habitat in prospective, forest modeling exercises. *Project Status:* Concluded. A draft report is available from DNR. *Principal Investigators:* Scott Horton and Steve Wetzel, WA DNR.
- *Determine the amount and distribution of nesting habitat needed to support nesting spotted owls within managed forest landscapes. - No strategic planning and/or pilot sampling research at this time*
- *Develop better stand- and landscape-level definitions for dispersal habitat. - No strategic planning and/or pilot sampling research at this time*
- *Determine how to manage and harvest timber within nesting and roosting/foraging habitats. - Ongoing research*
- **Testing Silvicultural Treatments Designed for Owl Habitat Management -**  
An empirical test of alternative thinning treatments has been designed for an OESF Timber sale. This test will compare traditional uniform thinning with two approaches to variable density thinning to un-thinned control treatments. *Project Status:* Initiated in 2000; all the planning and design is complete; and some pretreatment measurements have been done. Timber sale right-of-way and low market prices have delayed the harvest of the experiment. *Principal Investigators:* Dr. Richard Bigley, and Dr. Teodora Minkova, WA DNR.
- **Assessment of Operational Feasibility for the Implementation of Habitat Creation Research on the OESF -**  
This project created a flexible analysis framework to evaluate the operational feasibility and economic viability of proposed research. This framework can be used to make future decisions on the Big Country Timber Sale, or on other sales with similar research criteria. The harvest prescription design was created to meet



the goals of HCP Research and Monitoring. The flexibility of our harvest plan allows prescriptions to be interchanged easily, allowing freedom to change with new information. The suggested final layout combines the results of the marketability matrix with operational feasibility and current conditions of the sale to create the best possible layout given the current information. See report at: [http://courses.washington.edu/fe450/projects/01\\_clallam/report/report/ExecutiveSummary.htm](http://courses.washington.edu/fe450/projects/01_clallam/report/report/ExecutiveSummary.htm) *Project Status:* Concluded in 2001. A report is also available from DNR. *Principal Investigators:* Dr. Peter Schiess *et al.*, University of Washington.

- **A Thinning and Access Strategy for Accelerated Stand Habitat Creation -**  
The project identified operationally feasible and economic options for research and monitoring on the HCP for the Olympic Experimental State Forest. The project developed a harvest and transportation plan that provided habitat and economic outcomes. It also identified alternative harvest strategies to aid in road density management, and highlights new technologies and ideas for providing more intuitive representations of potential management outcomes in a visual format. The plan identified harvest systems by setting, providing information needed to determine the type of silvicultural systems that can be implemented on a setting basis. See report at: [http://courses.washington.edu/fe450/projects/00\\_solduc/report/report2000.pdf](http://courses.washington.edu/fe450/projects/00_solduc/report/report2000.pdf). *Project Status:* Initiated and concluded in 2000. A report is also available from DNR. *Principal Investigators:* Dr. Peter Schiess *et al.* University of Washington.

#### ***Priority 1 Marbled Murrelet***

- *Evaluate the habitat relationships of murrelets occupying DNR-managed lands. Determine which areas and habitat conditions support nesting murrelets. - Ongoing research*
- **Habitat Relationship Study and Interim Marbled Murrelet Conservation Strategy -**  
Marbled Murrelet inland (stand level) surveys were conducted to support the development of the long-term conservation strategy. To date, the department has conducted, primarily through contract, surveys for over 83,000 acres of state land and has surveyed about 1,464 sites. See summary under “*Status of the marbled murrelet long-term conservation strategy*”. *Project Status:* Concluded or ongoing. *Principal Contact:* Danielle Escene, WA DNR.
- *Determine whether certain breeding sites are more important to the population than others and, if so, identify the conditions that influence these differences. - Ongoing research*
- **Population Ecology of Marbled Murrelets –**  
While inland surveys to document occupancy status of forest stands have been conducted for a decade, very little work has been done on murrelet demography or nest site description. Washington has only 11 known murrelet nests. Information on the nest site characteristics and the way murrelets utilize the

forested landscape will be invaluable in implementing the department's long-term conservation strategy for murrelets. This project uses radiotelemetry to locate active murrelet nests and conduct detailed research on the survival, nest success, flight behavior, and genetic makeup of murrelets found in Washington marine waters. *Project Status*: Initiated in 2000 with a test of murrelet capture methodology; full implementation of the project will take place in the spring of 2004 in the Straits of Juan de Fuca. *Principal Investigators*, Dr. Martin Raphael, PNW Forestry Sciences Lab, and Dr. John Marzluff, University of Washington.

▪ **Variation In Marbled Murrelet Activity Using Old-Growth Stands On The OESF –**

This project uses murrelet survey data collected in the OESF to fulfill the HCP commitment of conducting a comprehensive inventory of murrelet use of potential habitat on state forests. Data were collected under DNR contracts (1994-2000), from 4,500 murrelet surveys in old-growth stands. The project consists of three discrete phases leading to a final product intended to help integrate murrelet conservation with other management objectives in the OESF. In order to control for extrinsic variability during subsequent analyses, Phase one seeks to describe variation in murrelet activity at daily, seasonal, and annual scales that can mask murrelet responses to habitat. Phase two intends to discover landscape-level correlates of murrelet activity in order to develop spatially-explicit models that predict the attractiveness of existing and potential nesting habitat to murrelets. In the third phase, murrelet habitat models will be integrated with spatially-explicit predation risk models resulting from John Marzluff's research in order to predict outcomes for murrelet conservation and other objectives that could result from a variety of potential future management pathways. *Project Status*: Initiated in 2001 as part of Scott Horton's graduate work at the University of Washington. *Principal Investigators*: Scott Horton, DNR; Dr. John Marzluff, University of Washington.

- *Develop the ability to delineate the boundaries of breeding sites. - Ongoing research*
  - See **Population Ecology of Marbled Murrelets** under Priority 1 *Marbled Murrelet*.

- *Determine how to protect and manage breeding sites. - Ongoing research*

▪ **Influence of Stand Structure, Proximity to Human Activity, and Forest Fragmentation on the Risk of Predation to Nests of Marbled Murrelets on the Olympic Peninsula -**

Nest predation is arguably the most important factor limiting the productivity of forest nesting birds. Corvids (ravens, crows, and jays) are thought to be the principal predators of murrelet eggs and nestlings. The project determined how predation rate and corvid abundance are influenced by forest structure, proximity to human activities, fragmentation of the landscape, and distance from forest edges. Knowledge of these landscape-level habitat relationships will help DNR make informed habitat management decisions and design successful, long-term

marbled murrelet conservation strategies. *Project Status*: Initiated in 1997 in the OESF, the project concluded in 2003. A summary report is available from DNR. *Principal Investigator*: Dr. John Marzluff, University of Washington.

- *Determine whether nesting murrelets can colonize unoccupied suitable habitat. - Ongoing research*
  - See **Population Ecology of Marbled Murrelets** under Priority 1 *Marbled Murrelet*.

#### **Priority 2 Riparian**

- *Determine how to harvest timber and meet conservation objectives within riparian areas. - Ongoing research*
  - **Restoring Riparian Ecosystems -**  
The project tests four prescriptions to convert hardwood dominated riparian areas to conifer stands. The results of these projects will help the department understand the effort and probability of success in conducting riparian stand conversions. *Project Status*: Initiated in 1998 on the OESF, post treatment measurements are currently being collected. *Principal Contact*: Dr. Richard Bigley, WA DNR.
  - **Riparian Silviculture Modeling -**  
This project developed a riparian-specific version of the Landscape Management System and riparian-specific silvicultural prescriptions. This modeling tool will help quantify working hypotheses being tested in effectiveness monitoring and alternative management to be tested through HCP research. *Project Status*: Initiated in 2001; the project concluded in 2003. A report is available from DNR. *Principal Investigators*: Jason Cross, Olympic Natural Resources Center and Dr Richard Bigley, WA DNR.
- *Determine how to harvest timber and meet conservation objectives on hillslopes with high mass-wasting potential without triggering land slides and causing adverse effects to fish habitat. - No strategic planning and/or pilot sampling research at this time*
- *Determine the best approach to growing healthy riparian buffers while managing the buffer for economic return. - Ongoing research*
  - **Ecological Classification of Riparian Vegetation on the OESF -**  
Adaptive management in riparian forests will require a basic classification to allow the transfer of site-specific information to other locations. This work will expand and complement the existing OESF upland forest plant association guide from Bigley and Hull (1995). *Project Status*: Initiated in 2000; the project concluded in 2002. A report is available from DNR. *Principal Investigator*: Chris Chappell, WA DNR.

- See **Riparian Silviculture Modeling** under Priority 2 *Riparian* research

#### **Priority 2 Spotted Owl**

- *Determine the types, amounts, and configurations of habitat required to support spotted owls in managed forest landscapes. - No strategic planning and/or pilot sampling research at this time*
- *Develop the ability to accelerate development of functional spotted owl nesting and roosting/foraging habitats in conjunction with commercial silvicultural activities and timber harvest. - Ongoing research*
- **Managing Young Stand Composition and Structure for Forest Productivity and Biodiversity –**  
The project tests four pre-commercial thinning regimes that are designed to restore diverse ecological stand structures and accelerate the development of quality wildlife habitat. The result of these tests will increase our ability to integrate early biodiversity type thinning into our stand management program with the aim of reducing the time required to balance habitat ratios on the landscape. *Project Status:* Initiated in 1999 in the OESF; the first set of post treatment measurements were taken in 2003. *Principal Investigator:* Dr. Richard Bigley, WA DNR.
- See **Assessment of Operational Feasibility for the Implementation of Habitat Creation Research** on the OESF under Priority 1 *Spotted Owl* research
- See **A Thinning and Access Strategy for Accelerated Stand Habitat Creation** under Priority 1 *Spotted Owl* research
- *Determine how to reduce the risk of catastrophic habitat loss due to fire, insects, or disease, while maintaining existing nesting and roosting/foraging habitats. - Ongoing research*
- **Alternatives for Management of Spotted Owl Habitat Klickitat HCP Planning Unit. -**  
Extensive stand growth modeling and the development and testing of alternative silvicultural treatments was conducted to support an amended spotted owl habitat strategy in the Klickitat HCP Planning Unit. The modeling determined the feasibility of a strategy that adds NRF management goals to lands more suited to growing and maintaining NRF habitat and lands than those currently designated as NRF. Alternative silvicultural treatments to maintain and create NRF stands were modeled and matched with areas shown to be most suited to growing and maintaining NRF habitat (such as the grand fir warm vegetation series). Suitable areas were evaluated based on vegetation series and site quality. *Project Status:* Initiated in 2002; analysis was concluded in 2003. A manuscript is currently in preparation. *Principal Investigator:* Dr. Bill Barber, WA DNR.

**Priority 2 Marbled Murrelet**

- Determine whether it is possible to harvest timber at or near breeding sites and meet conservation objectives. - **No strategic planning and/or pilot sampling research at this time**

**Priority 2 Multispecies**

- Determine how to design, create, and manage landscape-level habitat patterns to benefit a variety of native animals that use the various forest ages and structures in a geographic area. - **No strategic planning and/or pilot sampling research at this time**

**Priority 3 Riparian**

- Develop basic information on the relationships between forest management activities and riparian ecosystems in managed forests. - **Ongoing research**
- **Riparian Adaptive Management Support Tools -**  
The integration, synthesis and application of information from the disciplines of geomorphology, silviculture, hydrology and fish biology are difficult. This work tested an existing computer-based tool to integrate information concerning the interaction between upland land management and changes in fish habitats. A Fish-Forestry Interaction Model will provide a focus for the synthesis of existing and future information on the impacts of forest management and natural processes on the quality of fish habitats on the western Olympic Peninsula. *Project Status:* Initiated in 2000; the project concluded in 2003. A report is available from DNR. *Principal Investigators:* Dr. David Peterson, U.S. Geological Survey, Biological Services Division and Dr Richard Bigley, WA DNR.
- **Modeling the Clearwater River Watershed with Ecosystems Diagnostics and Treatment (EDT) –**  
The EDT method provides a practical, science-based approach for developing and implementing watershed plans. Based on the biological performance of salmon at various life stages, and a comparison of suggested historical and current habitat conditions, the method provides decision makers with the technical information needed to develop plans that will achieve their goals. The intent of applying the EDT to the Clearwater River Basin on the OESF is to determine its utility as a long-term monitoring framework and decision support system for research and validation monitoring of the HCP's riparian conservation strategies. *Project Status:* Initiated in 2000; work continues as part of the graduate work of Larry Dominguez at The Evergreen State College. *Principal Investigator:* Larry Dominguez, WA DNR
- See **Functional role of down woody debris and long-term Site Productivity** under Priority 1 *Spotted Owl* research.
- **Landslide Characterization and Salmon Spawning Gravel Changes -** An inherent characteristic of the steep slopes of the Olympic Mountains is a

continuous interaction between upland geomorphologic processes and streams. A major slope failure on the Solleks River during the winter of 1998 provided an opportunity to monitor the interaction. Changes in the spawning gravel composition and cutthroat trout populations down stream were monitored.

*Project Status:* Initiated in 2000; the project concluded in 2002. A report is available from DNR. *Principal Investigators:* Carol Serdar, The Evergreen State College and Jeff Cederholm, WA DNR

- *Develop basic information on the relationships between forest management activities and hydrology in managed forests, particularly the relationships among forest management activities, basin soils, and stream-channel/stream –bed changes during rain-on-snow floods. - No strategic planning and/or pilot sampling research at this time*

### **Priority 3 Spotted Owl**

- *Determine whether snags are a necessary part of northern flying squirrel habitat in eastern Washington. - No strategic planning and/or pilot sampling research at this time*

### **Priority 3 Marbled Murrelet**

- *Develop basic information on murrelet ecology. - Ongoing research*
  - **At-Sea Distribution and Abundance of Marbled Murrelets in Relation to Marine Habitat on the Outer Coast of Washington - Research**

Natural resource agencies have realized that demographic data such as population size and reproductive success of marbled murrelets cannot be estimated in the terrestrial environment because of logistical, temporal, and financial constraints. Instead, marbled murrelet population size must be estimated from data collected in the marine environment. This project is part of a large cooperative marbled murrelet population study. See summary reports at:  
[http://www.fs.fed.us/pnw/olympia/wet/2002/Murrelet%202002%20Rpt\\_9\\_12\\_03.pdf](http://www.fs.fed.us/pnw/olympia/wet/2002/Murrelet%202002%20Rpt_9_12_03.pdf). *Project Status:* Initiated in 1998, the project is part of a long-term project that may become an important part of HCP validation monitoring. *Principal Cooperators:* Dr. Chris Thompson, WDFW.

## **Chapter 10: Type 5 Stream Research**

### **Experimental Manipulation of Forested Headwater Stream Buffers in Washington State**

**Richard Bigley, WA DNR**

#### **Introduction**

The Washington State Department of Natural Resources (DNR) and the USDA Forest Service – Pacific Northwest Research Station – Olympia Forestry Sciences Laboratory in Olympia, Washington have initiated a research project to experimentally test a range of forested buffer configurations on the ecological functions and wildlife habitat supported by small headwater streams in western Washington. Small, non-fish bearing, often seasonal streams comprise an estimated 50% of the total length of streams on state lands in western Washington. Currently, the ability to evaluate the effectiveness of different approaches to forest management on the ecology of these streams and the possible downstream effects to fish-bearing streams is limited.

This project will examine the effects of different stream buffers in association with timber harvest on small headwater (1<sup>st</sup> order) streams in western Washington. The results are intended to provide a better understanding of what stream function(s) should be protected and the buffer configurations necessary to protect those functions. The DNR, the Olympia Forestry Sciences Laboratory, and the University of Washington are initiating a number of research studies examining both the biotic and abiotic functions of these small streams in support of this project.

As of the winter of 2004, nine study sites, including 34 streams, are being monitored on state lands in the Capitol State Forest and Pacific County. Pre-treatment sampling was conducted for 1 to 2 years and is now complete. Post-treatment sampling will begin the summer of 2004.

#### **Background**

Most of the conservation strategies were defined during the development of the DNR Habitat Conservation Plan (HCP). One notable exception within the riparian conservation strategy was the protection needs for non-fish bearing seasonal waters (Type 5 or NS streams). As part of the HCP agreement, the Implementation Agreement Adaptive Management section (DNR 1997 B. 11) specifies that the department will develop a long-term conservation strategy for Type 5 streams within 10 years. In the interim, Type 5 waters will be protected under the Forest Resources Plan to maintain water quality, fisheries habitat, stream banks, wildlife, and other aquatic systems. This is stated on page IV 79 of the HCP<sup>1</sup> as follows:

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<sup>1</sup> Washington Department of Natural Resources. 1997. Final Habitat Conservation Plan

**“...during the first 10 years of this HCP, Type 5 waters not associated with unstable slopes will be protected only ‘when necessary for water quality, fisheries habitat, stream banks, wildlife, and other important elements of the aquatic system.’ ”**

The HCP did define, as part of the Forest Resources Plan and HCP, wetland protection for wetlands 0.25 acres and larger. The HCP recognized that these smaller wetlands are very valuable ecologically and cannot be separated functionally or in a regulatory fashion from small streams. This is expressed in the HCP<sup>1</sup> section IV 69 as follows:

**“Seeps and wetlands smaller than 0.25 acre will be afforded the same protection as Type 5 waters. That is, such features will be protected where part of an unstable hillslope. Research to study the effect on aquatic resources of forest management in and around seeps and small wetlands will be included in research programs for Type 5 waters.”**

## **DNR Type 5 Literature Review**

In support of the long-term conservation strategy, a literature review was created for Type 5 streams. This literature review focuses on the effect Type 5 streams have on the downstream system, their interactions with the upland environment, their functions, and options for protection. This literature review can be found at the following web address: <http://www2.wadnr.gov/type5/default.asp>.

## **DNR Type 5 Research Overview**

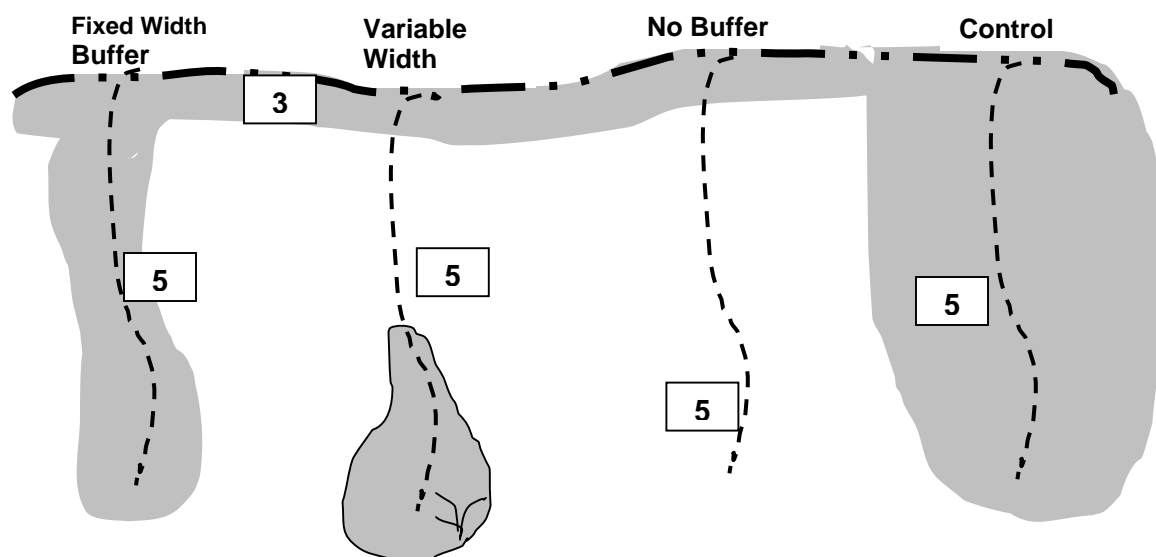
To study the potential effects of different management approaches, several research and monitoring sites were selected in western Washington on DNR-managed, state lands. The following key questions define the objectives of the project:

- ❑ What specific Type 5 stream functions should be protected and how will these be measured?
- ❑ How does timber harvesting affect Type 5 stream functions, i.e., sediment delivery, channel morphology, water chemistry, changes in plant communities, water levels and amphibian and invertebrate populations?
- ❑ What are the options for protecting Type 5 stream functions within the scope of the DNR Habitat Conservation Plan riparian management strategy?

The study design will impose a range of management configurations on adjacent Type 5 streams. Three buffer configurations are being compared: variable width buffers, fixed width buffers, and no buffers. An unmanaged basin will be used as a control (Refer to Figure 1). The variable width buffer is defined as a buffer protecting “sensitive areas” located along the stream or within the sub-basin. This buffer may have discontinuous sections. A fixed width buffer is defined as a continuous buffer along the stream. On a stream with no buffer, the entire Type 5 segment is harvested with a 30’ equipment exclusion zone from the stream channel.



**Figure 10.1: Conceptual design of small headwater stream research sites established by DNR.**



## Research Studies

Concurrent research studies in support of the Type 5 project will examine the effects of different buffer configurations on litter fall input, aquatic invertebrates, riparian mollusks, stream-associated and terrestrial amphibians, small mammals, stream temperature, down woody debris, fish, understory vegetation, stand composition, water levels and channel head migrations. Current cooperators include US Forest Service, the University of Washington, and the Washington State Department of Ecology.

## Major Study Elements:

*Streamside Vegetation:* Overstory and understory response, including changes in species abundance, diversity and stature, will be measured before and after treatment. Data will be compared within and among treatment sites. A set of permanent, randomly located plot arrays will be used in each buffer treatment. Permanent, variable-radius overstory plots and fixed-area understory plots will allow comparisons through time. Permanent photo points will document ground and canopy conditions and allow the calculation of canopy cover changes. Principal Investigator: Dr. Richard Bigley, DNR.

*Down Woody Debris:* Changes in the amount and decay class of woody debris will be measured in and along the study streams before and after treatment. Data will be compared within and among treatment sites. A set of permanent, randomly located line transects will be used in each buffer treatment. In addition, this data will provide context for measurement of animal abundance and sediment storage in the stream channel. Principal Investigator: Dr. Richard Bigley, DNR.

*Stream-dwelling amphibians:* The abundance and diversity of stream-dwelling amphibians will be measured in each stream reach before and after treatment. Data will be compared within and among treatment sites. Target species include the tailed frog (*Ascaphus truei*), Cope's giant salamander (*Dicamptodon copei*), Pacific giant salamander (*Dicamptodon tenebrosus*), Columbia torrent salamander (*Rhyacotriton kezeri*), red-legged frog (*Rana aurora*), and Pacific tree frog (*Pseudacris regilla*). The primary sampling method will be the spotlight survey (Jones and Raphael, in press) because of its low impact on the stream substrate. If variances are too large, the rapid assessment method (Hayes et al 2001) may be added and visits to each stream will be conducted less frequently. Principal Investigator: Dr. Martin Raphael, Olympia Forestry Sciences Laboratory.

*Stream-bank and terrestrial amphibians:* The abundance and diversity of terrestrial amphibians will be measured along each stream reach before and after treatment. Data will be compared within and among treatment sites. Target species include the western red-backed salamander (*Plethodon vehiculum*), Ensatina (*Ensatina escholtzii*), Van Dyke's salamander (*P. vandykei*), northwestern salamander (*Abystoma gracile*), and rough-skinned newt (*Taricha granulosa*). These species will be captured using pitfall arrays. An array consists of 18 traps spaced at 5-meter intervals and arranged in a zigzag pattern. One array will be placed along each side of the stream within 2 meters of the primary stream channel, for a total of 36 traps per stream. Traps will be set continuously from May to September each year. Principal Investigator: Dr. Martin Raphael, Olympia Forestry Sciences Laboratory.

*Small mammals:* The abundance and diversity of small mammals will be measured along each stream reach before and after treatment. Data will be compared within and among treatment sites. Target species include insectivorous, cricetine, and microtine mammals, such as shrews (*Sorex* spp), moles (*Scapanus* spp), deer mice (*Peromyscus* spp), and voles (*Clethrionomys* and *Microtus*). Insectivores and some voles will be captured using pitfall arrays (as described above); voles and cricetines will be captured in live traps. Two live traps will be placed within 2 meters of each pitfall; traps will be set for 10 days during August each year. Principal Investigator: Dr. Martin Raphael, Olympia Forestry Sciences Laboratory.

*Aquatic invertebrates and detritus:* The abundance and diversity of aquatic invertebrates and the contribution of fine particulate organic matter to downstream fish-bearing waters will be measured before and after treatment. Data will be compared within and among treatment sites. Invertebrates and detritus are collected at 3 to 6 week intervals (depending on season) in drift nets installed at weirs located at the downstream end of each headwater channel. Organisms are identified to order, family, or genus. Detritus is dried and weighed. Results will be expressed in units of weight per unit volume of water. Principal Investigator: Dr. Peter Bisson, Olympia Forestry Sciences Laboratory.

*Litter input:* The amount of forest litter deposited in the headwater streams or adjacent riparian zones will be measured before and after treatment. Data will be compared within and among treatment sites. Litter is collected every 30 days from an array of litter traps

located along the streams and sorted into its relative components (leaves, needles, twigs, etc.). Data will be reported as litter biomass per square meter of stream or riparian zone. Principal Investigator: Dr. Peter Bisson, Olympia Forestry Sciences Laboratory.

*Riparian mollusks:* The abundance and diversity of mollusks (primarily snails and slugs) in riparian areas along each stream reach will be measured before and after treatment. Data will be compared within and among treatment sites. A combination of laminated cardboard “cover structures” and duff samples will be used to determine species composition and relative abundance. Sample sites are arrayed in a grid along each headwater stream. Mollusk surveys take place in fall and spring. Principal Investigator: Dr. Joan Ziegltrum, Portland Forestry Sciences Laboratory.

*Fishes:* The abundance of fishes in each fish-bearing stream into which the small, non-fish-bearing streams drain will be measured before and after treatment. Data will be compared within and among treatment sites. In particular, surveys will look for aggregations of fishes (primarily native trout and sculpins) near the mouths of the headwater streams, which would indicate that the streams contribute something of ecological importance (e.g., food organisms, cool water) to fishes in the receiving stream. The lowermost reaches of each stream will be surveyed to determine if they are occupied seasonally, for example, during winter. All fish surveys are accomplished by backpack electrofishing. A Scientific Study Permit for this activity has been obtained from the Washington Department of Fish and Wildlife. Principal Investigator: Dr. Peter Bisson, Olympia Forestry Sciences Laboratory.

*Stream temperature:* Stream temperature at the downstream end of each headwater stream, as well as changes in stream temperature in the receiving stream resulting from discharge from the small watersheds will be measured before and after treatment. Data will be compared within and among treatment sites. Electronic temperature loggers (i-buttons) are located above, at, and below the mouth of each small stream, as well as in the lowermost 50 meters of the streams themselves. Temperature monitoring extends from late spring to late fall. Maps of temperature sensitivity before and after treatments will be constructed. Summer peak temperatures will be evaluated to 303d thermal listing criteria for water quality impairment. Principal Investigator Dr. Peter Bisson, Olympia Forestry Sciences Laboratory.

## Chapter 11: Funding for Monitoring and Research

### Funding Sources

- DNR generates revenue for the trusts, as mandated by the Enabling Act
- Of the revenue generated by the trusts, 75% goes to the beneficiaries and 25% goes back to DNR to support land management activities

### Budget Allocation

- Every biennium, DNR prepares a budget which is funded out of the management funds. The budget is then submitted to the legislature for allotment and approval.
- The funds needed for the implementation, monitoring and research of the HCP are a part of the budget that is presented to the legislature every biennium for approval. Table 11.1 and Figure 11.1 show all the monies allotted to the HCP program since 1997.

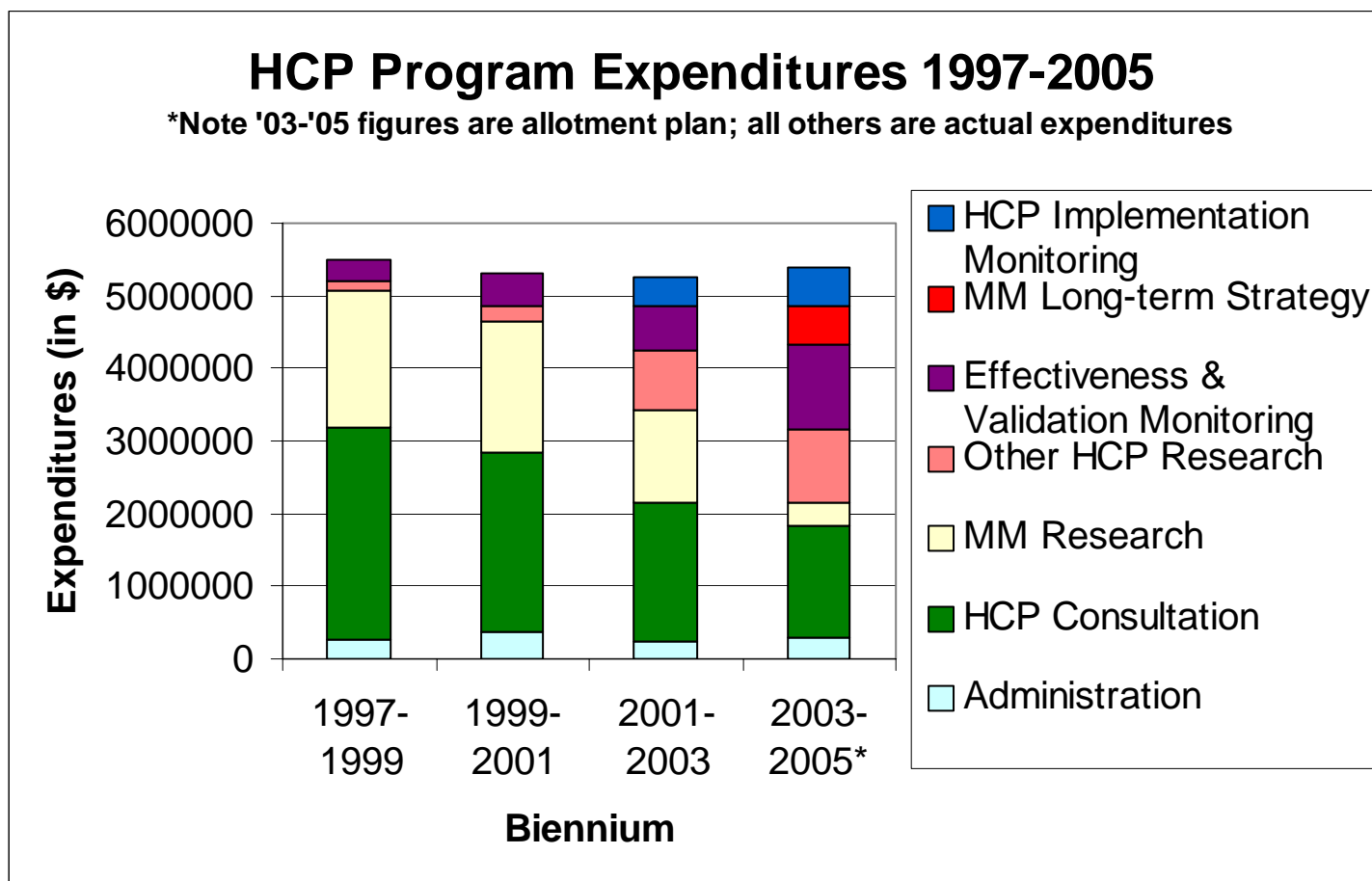
**Table 11.1: Funding allotments for the HCP program from 1997-2003**

Biennium	Administration	HCP Consultation	MM Research	Other HCP Research	Effectiveness & Validation Monitoring	MM Long-term Strategy	HCP Implementation Monitoring	Total
1997-1999	273,011	2,925,311	1,877,224	139,224	282,597			5,497,367
1999-2001	375,000	2,455,842	1,816,899	213,571	461,558			5,322,870
2001-2003	250,128	1,891,209	1,271,000	840,882	612,996		400,000	5,266,215
2003-2005*	282,600	1,540,500	330,000	1,000,000	1,186,300	530,000	519,100	5,388,500
<b>Total for Eight Years</b>	<b>1,180,739</b>	<b>8,812,862</b>	<b>5,295,123</b>	<b>3,464,677</b>	<b>2,543,451</b>	<b>530,000</b>	<b>919,100</b>	<b>21,474,952</b>

\* Figures for 2003-2005 are the allotment plan; all other figures are actual expenditures

The money allotted for consultation provided scientific support to those in charge of on-the-ground implementation of the HCP. This was a big proportion at the beginning, but the ratios have been changing, with more going to monitoring and research as we move farther from the date of implementation.

Figure 11.1: Relative funding allocations to various HCP program components, 1997-2005.



## **Chapter 12: Implementation, Validation and Effectiveness Monitoring**

### **Implementation, Effectiveness and Validation Monitoring Defined**

- Were the conservation strategies implemented as written? (Implementation)
- Did implementation of the strategies result in the anticipated habitat conditions? (Effectiveness)
- Evaluate the cause-and-effect relationships between habitat conditions resulting from implementation of the conservation strategies and the animal populations that these strategies are intended to benefit (Validation)

### **Monitoring Overview**

- Prior to 2001, implementation, effectiveness and validation monitoring were limited due to staffing and funding priorities
- Beginning in 2001, administrative changes (organizational and funding reallocations) have enabled a new emphasis on implementation, effectiveness and validation monitoring

### **DNR Has Added Staff to Facilitate:**

- Implementation Monitoring (centralized approach)
- Effectiveness and Validation Monitoring (a more detailed, specific strategy approach)
- Riparian Effectiveness Monitoring
- Spotted Owl Effectiveness and Validation Monitoring
- Marbled Murrelet Monitoring (to begin after the long-term strategy is completed)
- Sediment Monitoring (roads)
- Unstable Slopes Monitoring

### **Implementation Monitoring Then...and Now**

- Began as a Region responsibility
  - Review criteria were mostly subjective; no yearly reports prepared
- In 2001, HCP Monitoring and Scientific Section established
  - Centralized reviews
  - Review criteria now objective; yearly reports prepared

### **Accomplishments**

- Completed Pilot Project in 2002
  - 2 Planning Units selected
  - Reviewed *Activities*
- Completed 1<sup>st</sup> Annual Review in 2003
  - All Planning Units reviewed
  - Reviewed HCP *Elements* (strategies)
  - Samples were stratified, then randomly selected

**Effectiveness Monitoring Accomplishments**

- Strategic planning on monitoring designs
- Modeling the effects and economic viability of different silvicultural prescriptions on development of spotted owl habitat
- Draft monitoring plans written for riparian and spotted owl
- Draft monitoring plans in development for roads and unstable slopes
- Several ongoing projects (many done in conjunction with the research projects outlined in Chapter 9)

**Effectiveness Monitoring Future Projects**

- Update and complete riparian and owl monitoring plans
- Complete unstable slopes and roads monitoring plans
- Spotted owl habitat creation and restoration (Pacific Cascade and South Puget Sound Regions)
- Monitoring sediment from roads (Pacific Cascade Region)
- Unstable slopes project (Kalaloch)
- Riparian monitoring (silviculture, instream conditions and trends, forest integrity)

## **Chapter 13: Strengthening HCP Implementation**

This was an open discussion between staff from DNR and the Services, focused on the question “How can the Services and DNR maintain and strengthen implementation of the HCP?” For a summary of this discussion, please see Section III.